FACTORY

MANAGEMENT AND MAINTENANCE

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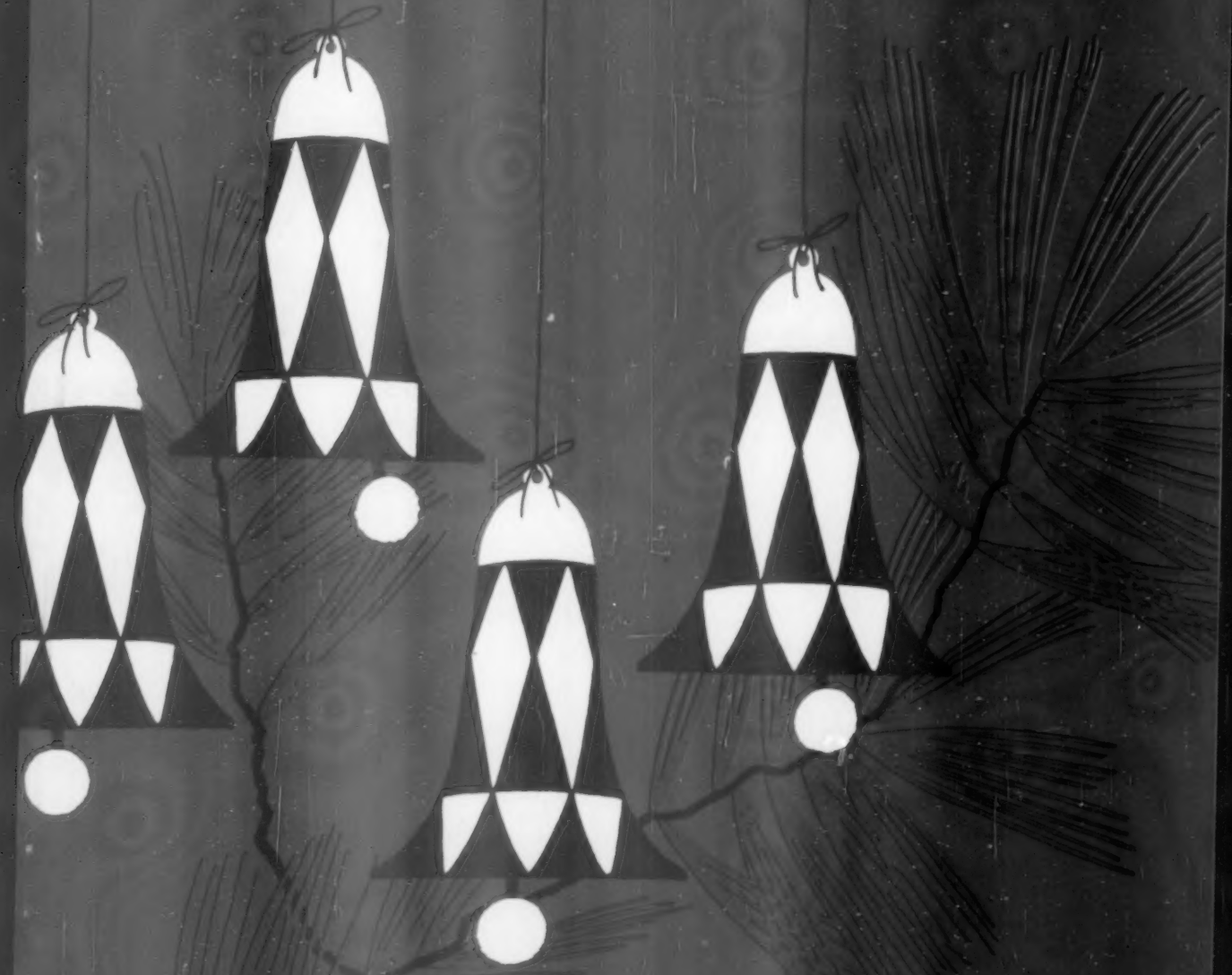

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Photo: Cleveland Engine Plant No. 1, Ford Motor Co.

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Problem: The combination of sharp edges and oil on those pistons was ruining conveyor belts in four months. They cut grooves in the belt, ripped it, tore off the fasteners which held the belt together. The oil soaked into the belt cover, softened it, formed a dirty scum on the surface. Belts had to be cleaned and repaired constantly.

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THE MAGAZINE OF PLANT OPERATING MANAGEMENT

Edited exclusively for the men with management responsibilty for production and maintenance in the manufacturing industries

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THIS SIMPLE FILING SYSTEM is designed to give quick access to past FACTORY articles that can help you solve current operating problems. Here's how it works:

1. All major articles and many short items are classified according to a functional code system (below). Codes cover basic operating responsibilities.

2. Where applicable, articles are also coded (see numbers in parentheses) to show secondary or closely related topics.

3. To use, cut up the items below. Paste them on 3x5-in. cards and file by code number. To cross-index, copy the information on a second card, and file by secondary code.

Note: For suggestions on using this new tool (plus an outline for a more complete decimal filing system), see FACTORY, February 1957, page 104.

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1.2 Buildings and Yards	2.2 Production Controls and Systems	3.2 Personnel Development
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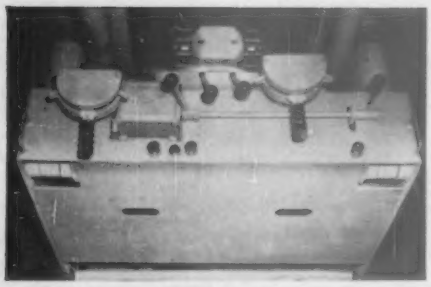

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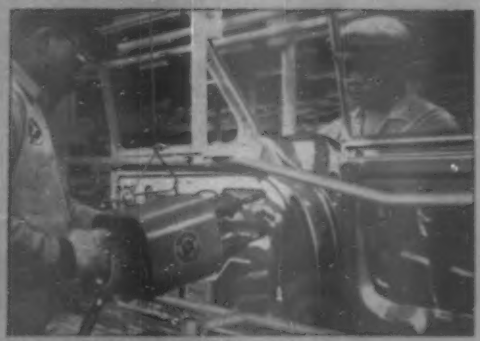

CP 4-spindle Magnamatic Multi-runner sets cap screws on window regulator with uniform tension, then releases instantly

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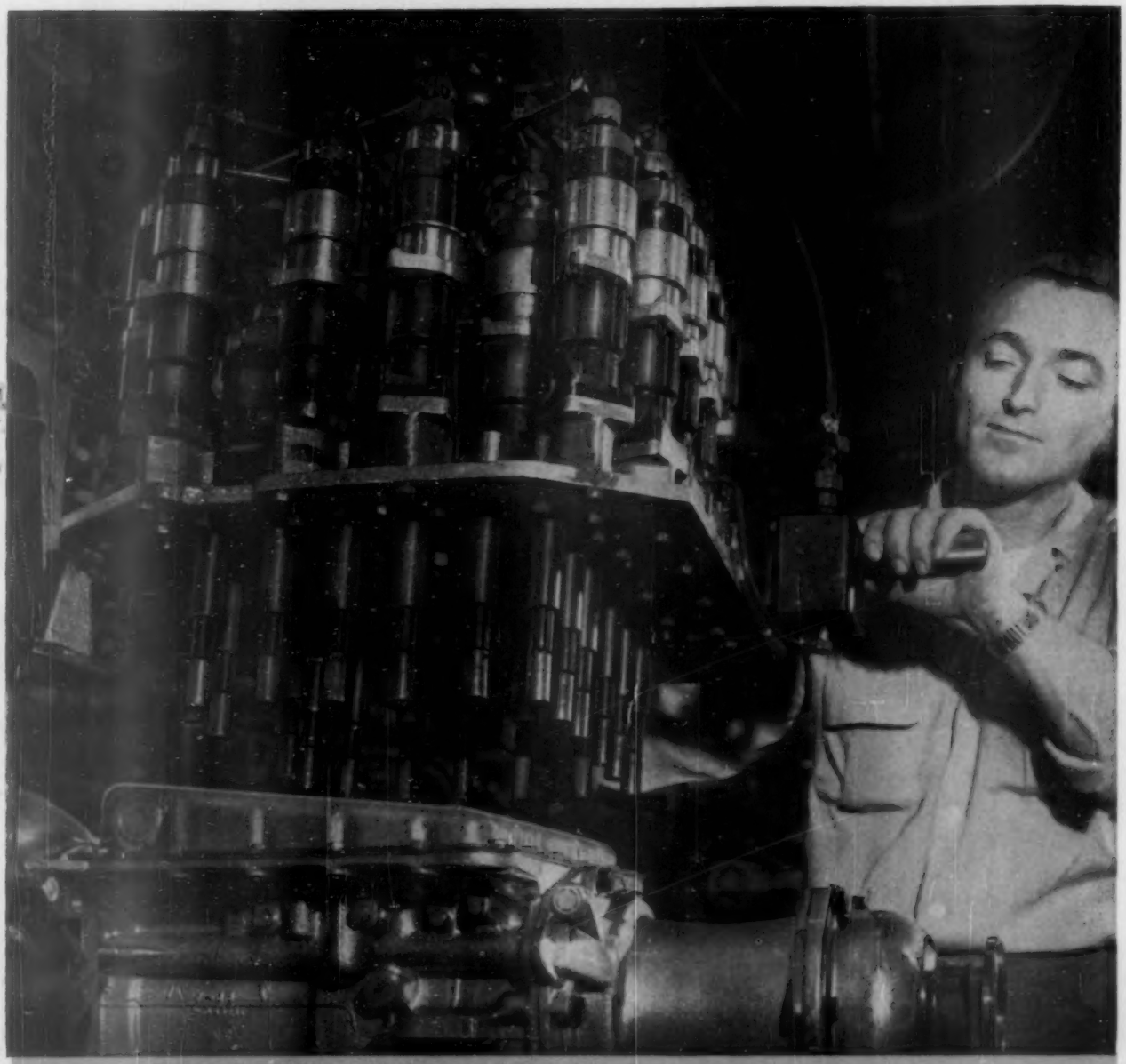

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FACTORY LETTERS

MORE ON CREDIT UNIONS

Sir:

We feel that your article ("Credit Unions Are Booming," April 1958, page 134) was very factual, and extremely interesting to all representatives of industry who had the opportunity of reading it . . .

Industrial managements believe that credit unions are assisting their employees in many ways. They feel that credit unions not only help employees save money systematically, but that they also assist them with productive loans. This helps employees to enjoy a fuller life and to overcome many of the worries they experience when they are forced to borrow from other sources.

The severely critical letter from Mr. Jack E. Reich of the Indiana State Chamber of Commerce (see "Letters," September 1958) was entirely out of order and uncalled for. We trust very much that this criticism will not in any way deter you from publishing articles about credit unions in the future.

L. B. Kilburn
Managing Director
Indiana Credit Union League
Indianapolis

Sir:

The letter from Mr. William White of the Ohio League of Credit Unions ("Letters," November 1958) more than adequately expressed the

Turn the page

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December 1958 Vol. 116, No. 12

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credit union reaction to Mr. Reich's charges . . .

We have felt a certain responsibility . . . since our public relations department shared in the research . . . We were therefore doubly pleased to read your straightforward and emphatic defense of your editorial policy in responding to Mr. Reich. You may be sure that Mr. Reich is also hearing from a good share of his organization's members. Industrial management people whose experience causes them to look with favor on credit unions far outnumber the few dissidents who see something sinister in these self-help organizations.

We would like permission from you to reproduce your letter to Mr. Reich to be distributed as needed to credit union people in areas where the Reich letter may have caused some disturbance.

Again may I say that we admire your editorial fortitude, not as a position favorable to credit unions, but as a firm stand for publishing what you believe.

H. Vance Austin
Managing Director
Credit Union National Assn., Inc.
Madison, Wis.

Sir:

You are to be commended for "Credit Unions are Booming."

We also found that our credit union has been a great asset in our personal relations with our employees. We sincerely hope that you may be able to publish many more such articles that are morale builders.

A. O. Harding
Treasurer
New Castle Products, Inc.
New Castle, Indiana

► The series of letters published in FACTORY (September *et seq.*) has covered all positions of commendation and condemnation of both credit unions and FACTORY's publication of the original article; also support and criticism of Mr. Reich's contention that FACTORY was indirectly "promoting socialism." Unless a wholly new point of view comes to light, we shall consider the question now closed.—ED.

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APPLIANCES This plant needed handling flexibility — special features of L-S electrics met their demands for peak delivery and production. Write for Case History 362-1.

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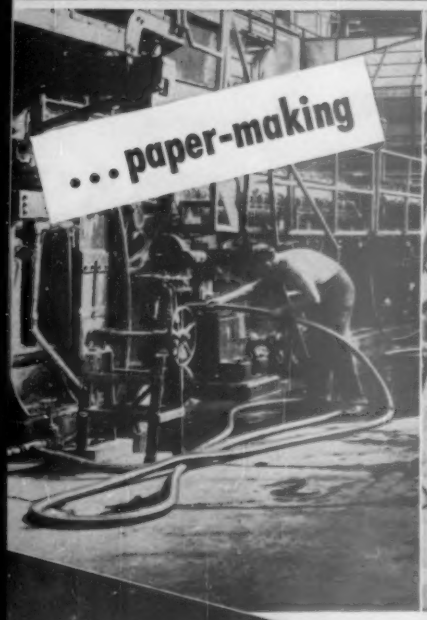

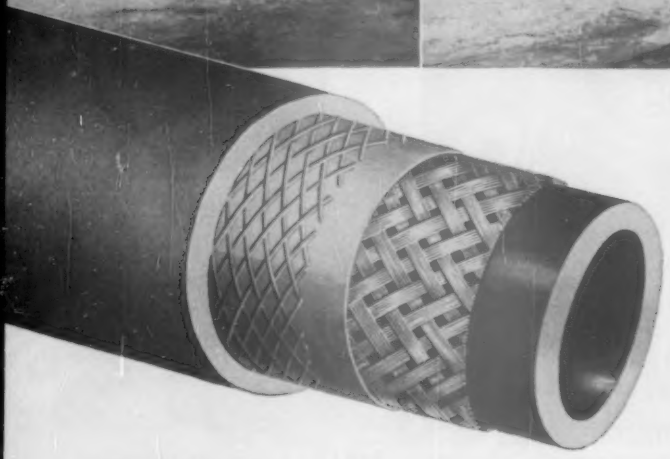

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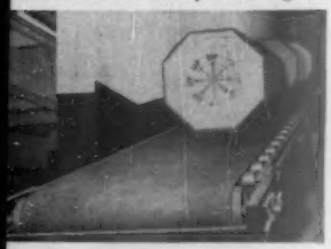
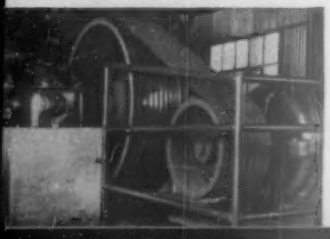


. . . and Thermoid Multi-V Belts



And for your job, too!

You'll find Thermoid has a hose that wears better, lasts longer, stays "on the job" to save you time and money. Each Thermoid Hose is built to do a specific job *best*. The same is true of Thermoid Conveyor Belting, Multi-V Belts and Friction Materials. Call your local Thermoid Distributor today.

Thermoid

Thermoid Company
Trenton, New Jersey
Nephi, Utah

FACTORY / LETTERS
Begins on page 8

CODING SYSTEMS

Sir:

Undoubtedly numerous systems have been developed to code maintenance stores parts. Practically, there must be some fairly universal system I could apply here. Are you aware of such a system or have you general information on parts coding systems for maintenance stores?

A. S. Marzo
Industrial Engineering Manager
Rapids-Standard Company, Inc.
Grand Rapids, Mich.

► Maintenance Editor Carl Wyder has been doing research on the problem for some time, just recently worked with Ted Wolf on an article (page 126) involving this point. Despite widespread use of 5- and 6-digit codes, Carl is convinced that nothing short of a 7-digit code will provide *all* the leeway you might need in the future: First two digits for major groups; next two for submajor groups; last three for specific parts. Anything less, says Carl, can get jammed up in spots, so that you have to adopt a new group number for any overflow. This leaves you with related parts in several places in your catalog.—ED.

HOW CLEAN CAN YOU GET?

Sir:

We are obtaining all available published articles and other data on the use of "Snow White" or "super-clean" areas for manufacturing operations. I have noted your article concerning the "super-clean" area of the Fafnir-Bearing Company (September 1957, page 124). I wonder if you have covered similar articles for other manufacturers who have accomplished this principle.

H. A. Stevens
Staff Engineer
Semiconductor-Components Div.
Texas Instruments Inc.
6000 Lemmon Ave., Dallas 9, Tex.

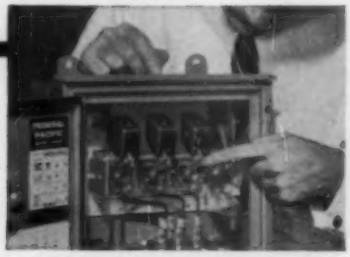
► With increased demand for fine tolerances and delicate electronic gear, interest in super-clean areas seems to be mushrooming. In addition to the Fafnir article, see "Tops in Controlled Conditions" (March 1958, page 102). Also, in each of

◄ Circle 457 on Reader Service Card

Before you buy Motor Controls... CONSIDER THESE FEATURES!

SUPERIOR ENCLOSURE CONSTRUCTION

Welded seams...sturdy piano hinge...slotted Hex cover retaining screws...cast aluminum handle...padlock provisions on handle *and* door...oil resistant neoprene gasket...mechanical cover interlock...rust-proof finish.



COOLER, SAFER SWITCHES

Visible blades...crossbar *under the blades*...deionizing arc quenchers...dual switchblade construction...only 2 joints per pole...pressure-type solderless lugs.

INLINE SOLENOID STARTERS

Easy-to-change, silver cadmium contacts...contact assembly rides on ball bearings...operating coil easily accessible...flexible coil leads...bi-metallic overload relay for manual or automatic resetting.

FEDERAL PACIFIC'S TYPE "K", NEMA XII COMBINATION MOTOR STARTER

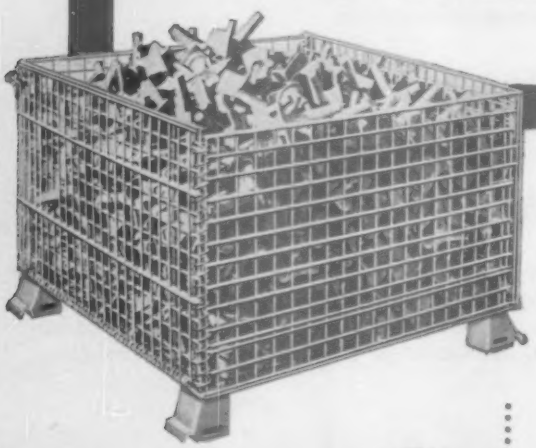
Designed for mass production industrial equipment, the quality features found in the Type "K" are typical of the kind of construction that goes into every device in the Federal Pacific line. Federal Pacific's manual or magnetic motor controls are available in NEMA sizes 0 through 5—with accessories to meet all practical requirements. Bulletin 514 gives full details on combination starters. For this or for specific information to cover your particular needs, write to: FEDERAL PACIFIC ELECTRIC COMPANY, General Offices: Newark, New Jersey.

FEDERAL FPE PACIFIC

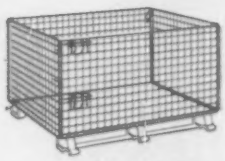
The Best in Electrical Distribution and Control Equipment

what's your..?

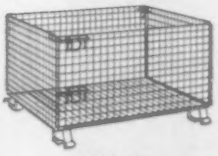
CARRYING CHARGE



6,000 pound unit loads are efficiently and economically handled in USP Palletainers—and, empty Palletainers can be "flat-folded" for space savings and lower return rates.



Bearing Plate



Hi-Lodo

Warehouse

Bulk-Lodo

What's it costing you to handle materials to and from production or assembly lines, in and out of storage, truck loading and transporting? There is an *easy way* . . . a practical, economical way with versatile USP Palletainers.

Palletainers have simplified materials handling for thousands of plants in scores of industries. And, these practically indestructible containers can save you valuable time and money both in and out of your plant. Whether you're processing, storing or distance-hauling, Palletainers provide the practical answer. Available in four basic types and a broad range of practical standardized sizes. They're engineered for safer handling, ceiling high stacking, faster 8-way entry for fork truck plus the advantages of content visibility for speedy inventory.

For Full Information on Palletainers...
including names and locations of users, or for obligation-free consultation on Palletainer application in your plant—write, wire or call Union Steel, today!

USP PALLETAINERS®

manufactured only by:

UNION STEEL PRODUCTS CO.
ALBION, MICHIGAN

FACTORY / LETTERS

Begins on page 8

the past two years, one or more of FACTORY's "Top Plants of the Year" has featured such areas: In May 1957, see the report on Miniature Precision Bearings Co.; in May 1958, see Beckman-Helipot Corp. and Polaroid Corp.—ED.

REAL OLD ARTICLES

Sir:

I am interested in production planning and scheduling as applied to electronic manufacturing. I remember that some time ago you had several articles on this subject. Can you supply any tearsheets?

Arthur Durage
Project Analysis
Raytheon Manufacturing Co.
Lowell, Mass.

► You probably remember "Materials Control in a Job Shop," a series of three articles in Oct., Nov., and Dec. 1953. We no longer have tearsheets (space requires us to dispose of unused tearsheets 12 months after publication). If you can't find copies in your company or public library, we can provide photostats from our bound reference volumes at 50¢ per page.—ED.

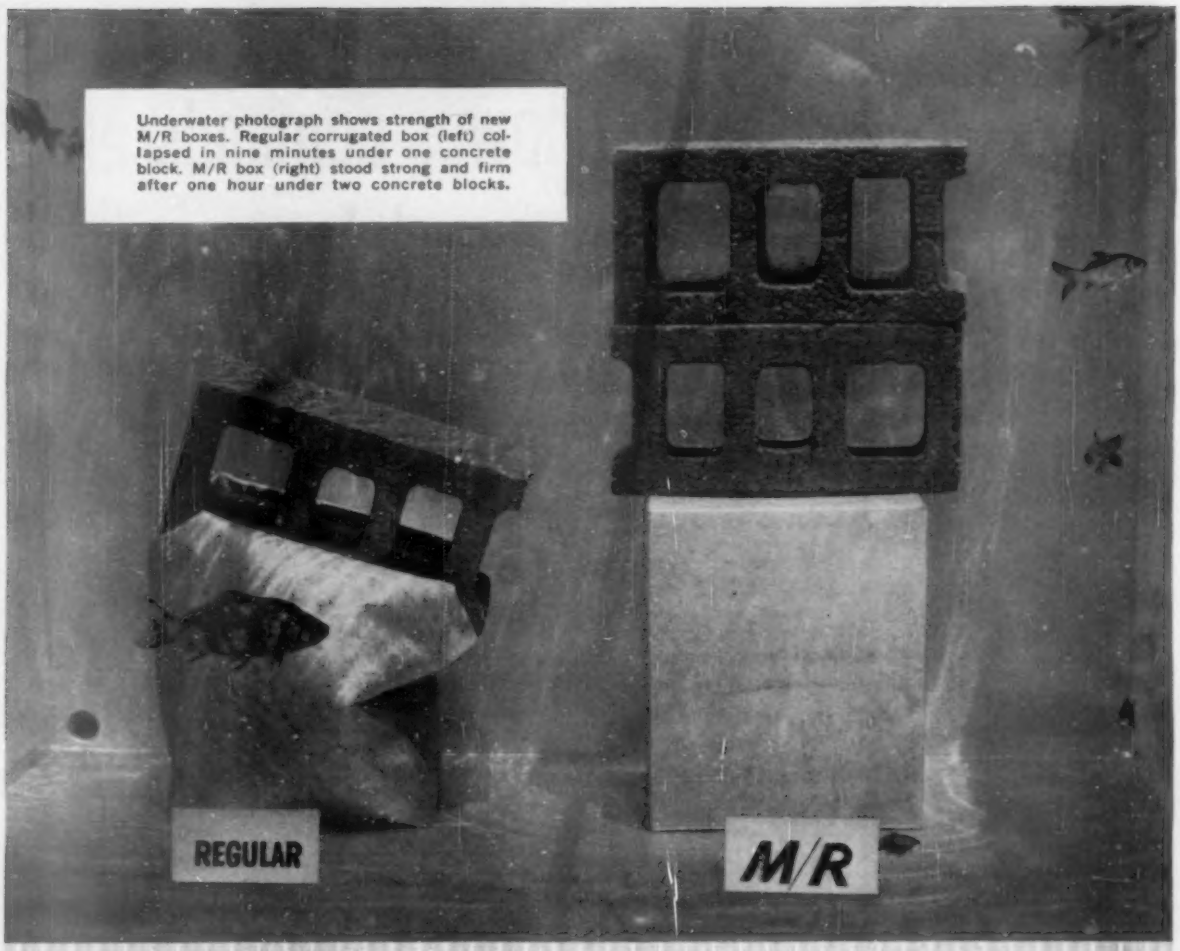
SORRY, NO FEE

Sir:

Would it be possible to have the enclosed book reviewed in one of the issues of FACTORY? I will be glad to pay any service or space charges which may be involved.

(Name withheld)

► The writer is a consultant; FACTORY withholds his name to avoid embarrassment. As is true of all newspapers and literary magazines (and, we assume, most business publications), FACTORY reviews books solely as a service to its readers. To insure that selection and opinions expressed are based exclusively on inherent merit, FACTORY does not assess any service or space charge; nor may the editors who sign the reviews accept any fee for reviewing. This same policy is followed for items in Equipment News, Catalog News, Materials News, Ideas of the Month—ED.



Underwater photograph shows strength of new M/R boxes. Regular corrugated box (left) collapsed in nine minutes under one concrete block. M/R box (right) stood strong and firm after one hour under two concrete blocks.

New *M/R* Corrugated Boxes

stay strong when wet... even under water!

Important news about Hinde & Dauch's new M/R (moisture resistant) corrugated boxes: Hydrocooler tests show M/R boxes shed water; stay strong and durable for packing and shipping all kinds of wet products. Moreover, M/R boxes stack high and straight, save packing and handling time, provide remarkable product protection. Initial tests indicate shipping damage to peaches reduced 50%. The smooth, clean surfaces of new M/R boxes can be colorfully printed with your brand message. H&D Package Engineers are ready to design an M/R corrugated box for your product. Write, wire or phone for complete information today!

HINDE & DAUCH
Division of West Virginia Pulp and Paper Company

AUTHORITY ON PACKAGING • SANDUSKY, OHIO
15 FACTORIES • 42 SALES OFFICES

HINDE & DAUCH Division of West Virginia Pulp and Paper Company
5809 Decatur Street, Sandusky, Ohio

Please rush me samples and detailed literature on new M/R corrugated board.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

How new LINK-BELT screw conveyor components

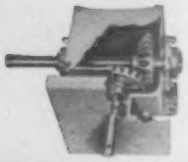
reduce power demands and maintenance delays

BALL BEARING HANGER has self-aligning bearing and seal—adjusts to suit shaft deflection. Square tube member of frame is positioned to permit easy passage of materials.

QUIK-LINK CONVEYOR SCREW. For ease in removal of conveyor section without dismantling other components. Feature can be furnished on Helicoid and Sectional Flight Conveyors.

TROUGH END SEAL assembled between flange block and trough end plate, keeps grease in, dirt out. Used with lip, felt or waste packing seal to prevent bearing-product contact.

DOUBLE BALL BEARING Flange Block employs two Link-Belt precision ball bearings spaced to withstand overhung load at drive end and take thrust loads of screw in either direction.



BALL AND ROLLER BEARING COUNTERSHAFT END. For drives at right angles to screw conveyor or common drive for two conveyors intersecting at right angles—absorbs thrust.

Complete line of accessories can be installed on new or existing systems

THOUGH just recently introduced, these Link-Belt screw conveyor components have already achieved a wide acceptance. Throughout industry, they're cutting power and maintenance demands to a new low.

Design refinements include the Quik-Link conveyor screw that makes removal of conveyor section possible without dismantling other components. Starting and running friction is reduced through the use of Link-Belt ball bearing hangers, as well as new ball bearing trough ends. Trough ends can be furnished with seals to protect bearings—seals are rabbetted for perfect bearing alignment.

For facts, call your nearby Link-Belt office or authorized stock-carrying distributor. Or write for Folder 2489.

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville (Sydney), N.S.W.; South Africa, Springs. Representatives Throughout the World.

LINK-BELT

14,702

SCREW CONVEYORS

For more facts Circle 461 on Reader Service Card

For more facts Circle 462 on Reader Service Card ➤

Pittsburgh COLOR DYNAMICS® used in Chrysler Corporation's huge new stamping plant

Modern system of painting helps to improve productive efficiency, morale and safety of workers in world's largest factory building located at Twinsburg, Ohio.

As another important step in the continuing expansion of its production facilities, Chrysler Corporation has activated its mammoth new stamping plant at Twinsburg, Ohio.

● **Walls, ceilings, floors,** machines, conveyors, motorized equipment and overhead cranes throughout this immense structure are painted according to Pittsburgh's modern system of COLOR DYNAMICS.

● **This huge building,** covering 1,835,900 square feet of space, is the world's largest plant under one roof. Here are produced roof and rear quarter panels, fenders, door panels, deck lids and other smaller body parts for all Chrysler Corporation cars and trucks. Production capacity is 2,000 tons of steel per day.

● **One of the impressive features** of this new plant is the greater use of modern machinery. As this equipment reduces physical fatigue by increasing efficiency in the handling of materials, so the functional use of color, according to COLOR DYNAMICS' principles, lessens eye fatigue and nervous tension among workers.

● **Proper use of eye-rest** and focal colors provides better contrast between working parts and materials being fabricated. Operators see their jobs better and with less eye strain. Morale-building colors on walls and ceiling reduce glare from light sources and eliminate heavy shadows, creating more pleasing work areas. Warning and safety colors on machine controls, conveyors, motorized equipment, traffic lanes and cranes indicate hazard areas and reduce the danger of time-loss accidents.

● **Chrysler's new Ohio stamping plant** is only one of thousands of factories in which COLOR DYNAMICS has helped to improve productive efficiency, morale and safety. Why not test the practical value of this modern painting system in your plant? You'll find it costs no more than conventional maintenance painting.

You can get a COLOR DYNAMICS Plan of Your Factory—FREE!

● For a complete explanation of COLOR DYNAMICS, send for our new profusely illustrated book. It explains simply and clearly what this new kind of painting system is and how to put it to work in your plant on machines, walls, floors, ceilings and mobile equipment. Better still, we'll gladly show you exactly how to apply it in your plant. Let us submit a detailed color study of your entire factory, or any part of it, without cost or obligation. Call your nearest Pittsburgh Plate Glass Company, or mail this coupon.

Send for a Copy of this FREE Book

Pittsburgh Plate Glass Co., Paint Div.,
Department FM-128, Pittsburgh 22, Pa.

☐ Please send me a FREE copy of your booklet "COLOR DYNAMICS."

☐ Please have your representative call for a COLOR DYNAMICS survey without obligation on our part.

Name_____

Street_____

City_____

County_____ State_____

PITTSBURGH® PAINTS

PAINT • GLASS • CHEMICALS • BRUSHES • PLASTICS • FIBER GLASS

PITTSBURGH PLATE GLASS COMPANY

IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED

"Off-the-shelf" delivery

—another example of how you benefit when you buy American Blower ventilating equipment

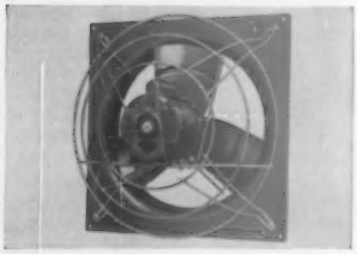
Boost employee efficiency in a hurry! Ventilate with quiet, efficient American Blower Ventura Fans—available "off-the-shelf" from *local* stock in most models and sizes.

Easy-to-install Ventura Fans move large volumes of air at low cost. All sizes are designed to meet realistic, uniform quietness ratings. Compact and attractive Ventura Fans also offer you:

- **Packaged ventilation** – Complete, ready to use. Just install, switch on power.
- **Pre-engineering** – Each model handles a wide range of capacities. Just pick proper fan directly from the catalog. No on-the-job engineering needed.
- **Certified Ratings**—Air deliveries meet rigid standard test codes.

For *every* ventilating job, there's an American Blower fan. Get details from your contractor or distributor today! Or contact one of our 73 branches. American-Standard,* American Blower Division, Detroit 32, Michigan. In Canada: Canadian Sirocco products, Windsor, Ontario.

It pays to standardize on American Blower!



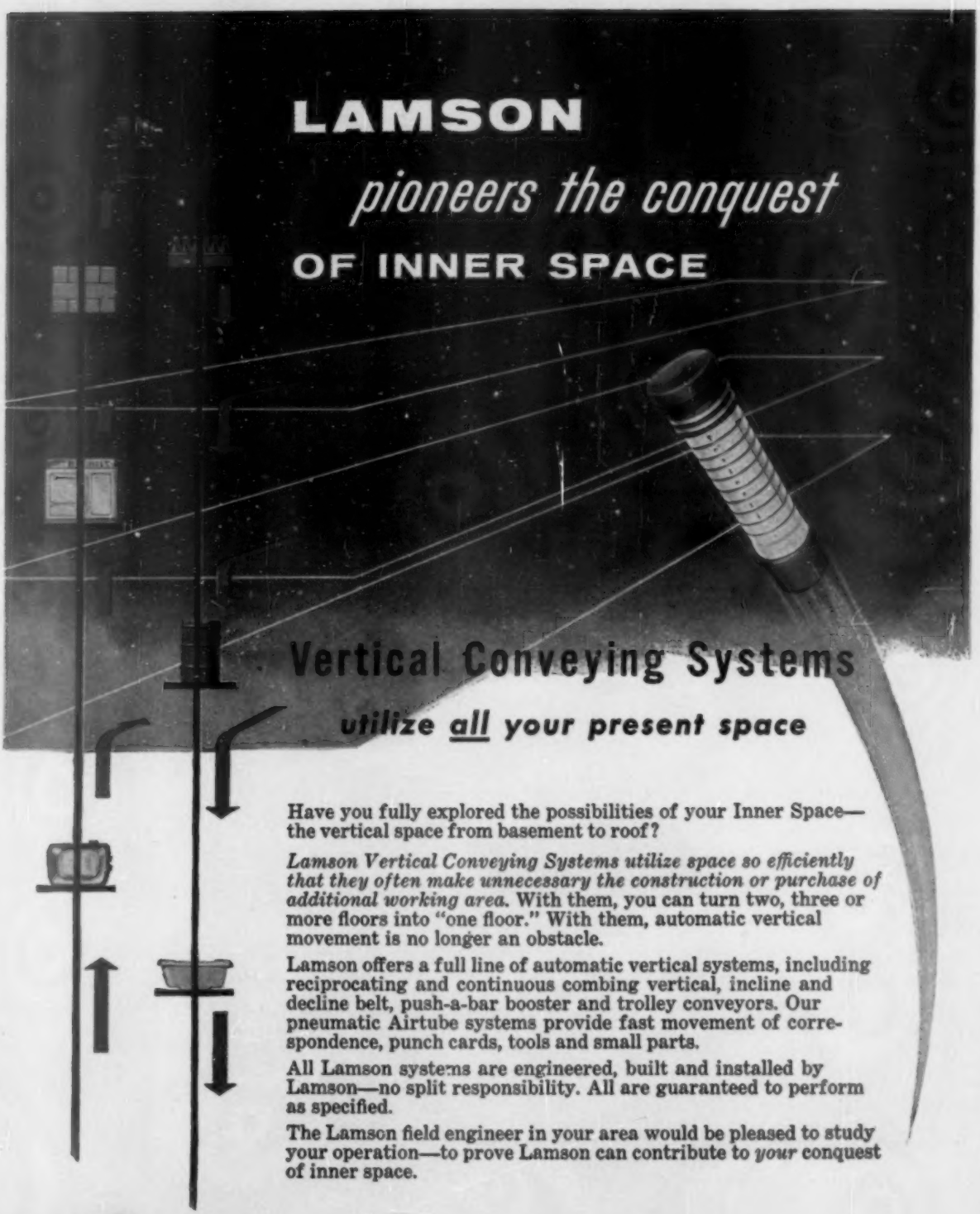
Ventura Fans – quiet, efficient, economical. Sizes from 10" to 30".

Utility Sets – direct drive, sizes 3" to 12¼"; V-belt drive, 9" to 36".

Power Roof Ventilators – available through American Blower branches.

* American-Standard and Standard® are trademarks of American Radiator & Standard Sanitary Corporation.

AMERICAN-Standard
AMERICAN BLOWER DIVISION



Have you fully explored the possibilities of your Inner Space—the vertical space from basement to roof?

Lamson Vertical Conveying Systems utilize space so efficiently that they often make unnecessary the construction or purchase of additional working area. With them, you can turn two, three or more floors into "one floor." With them, automatic vertical movement is no longer an obstacle.

Lamson offers a full line of automatic vertical systems, including reciprocating and continuous combing vertical, incline and decline belt, push-a-bar booster and trolley conveyors. Our pneumatic Airtube systems provide fast movement of correspondence, punch cards, tools and small parts.

All Lamson systems are engineered, built and installed by Lamson—no split responsibility. All are guaranteed to perform as specified.

The Lamson field engineer in your area would be pleased to study your operation—to prove Lamson can contribute to *your* conquest of inner space.

LAMSON

LAMSON CORPORATION • 1203 Lamson Street, Syracuse 1, N. Y.

Plants in Syracuse and San Francisco Offices in All Principal Cities

Manufacturers of Pneumatic Airtube® Systems • Integrated Conveying Systems • Pallet Loaders • Selective Vertical Conveyors • Bookveyors® • Clinical History Lifts • Trayveyors® • Food Service Systems • Erecto® Conveyors • Blowers and Exhausters • Exidust® Central Vacuum Cleaning Systems • Dryvac® Air Vacuum Systems • Mobilift® Industrial Trucks

®Trade Name

For more facts Circle 463 on Reader Service Card

For more facts Circle 464 on Reader Service Card

How to cut costs with the RIGHT motor

Don't be baffled by power factors, torques, efficiencies, and starting, accelerating, and thermal characteristics, or housing, horsepower and speed control. Let Century Electric help you balance these factors to cut operating costs with the *right* motor.

Here's how Century Electric can help you:

10,000 choices—Century Electric engineers can help you specify the right motor without having to rely on a few types to do all jobs. Century Electric makes a complete variety of integral horsepower motors. Over 10,000 types up to 400 hp. There is one for every type of equipment—transfer machines, ball mill drives, compressors, drilling machines, lathes, etc. For all operating conditions too—dusty, corrosive, explosive or moist.

Long life motors—And you get years of dependable operation from Century Electric motors. They are manufactured to rigid quality standards. Electrical tests and other checks on operating characteristics made during manufacture assure you the best motor for your money.

Application know-how—Every Century Electric sales engineer knows motor drive systems because he sells motors and nothing but motors. Often he can give you on-the-spot answers. If not, he can turn to an engineering staff that comes up with quick answers.

You can get the right motor for your equipment just by contacting your nearest Century Electric Sales Office or Authorized Distributor. A Century Electric sales engineer will be glad to help you.

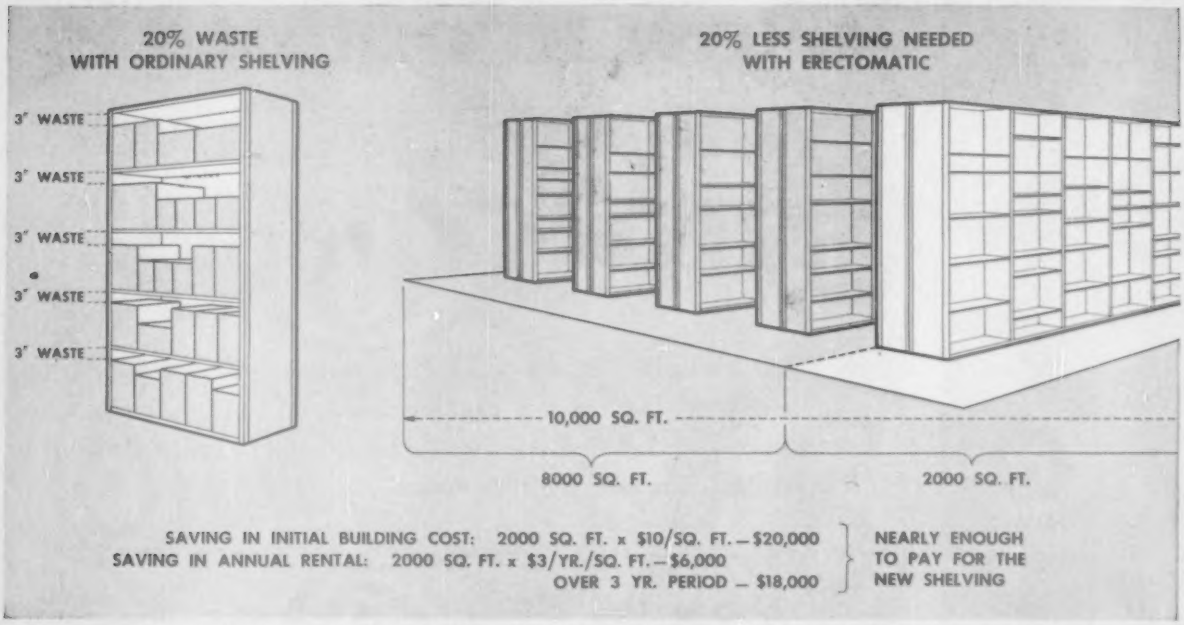
CENTURY ELECTRIC COMPANY

St. Louis 3, Missouri *Offices and Stock Points in Principal Cities*

Century

58-22

For more facts Circle 465 on Reader Service Card


20% WASTE
WITH ORDINARY SHELVING
3" WASTE
3" WASTE
3" WASTE
3" WASTE
3" WASTE
20% LESS SHELVING NEEDED
WITH ERECTOMATIC
10,000 SQ. FT.
8000 SQ. FT.
2000 SQ. FT.
SAVING IN INITIAL BUILDING COST: 2000 SQ. FT. x $10/SQ. FT. — $20,000
SAVING IN ANNUAL RENTAL: 2000 SQ. FT. x $3/YR./SQ. FT. — $6,000
OVER 3 YR. PERIOD — $18,000
NEARLY ENOUGH TO PAY FOR THE NEW SHELVING

A typical example of the savings in space made possible by Hallowell ERECTOMATIC steel shelving is illustrated above.

8000 square feet of Hallowell *ERECTOMATIC* Steel Shelving can hold as much as 10,000 square feet of ordinary shelving

Reduction in floor space and shelving is made possible by quick-change shelf positioning and exclusive corner post construction, permitting more effective utilization of area between shelves.

More effective utilization of the area between shelves can provide major savings in industrial and commercial shelving installations—whether you own, rent, or are planning to build the area required for storage.

Hallowell ERECTOMATIC® Steel Shelving permits such utilization. Quick-change shelf positioning eliminates waste in vertical spacing, increases the usable storage area by as much as 20%. Exclusive corner post construction permits full utilization of shelf width, too. Typical savings in initial building costs and annual costs are listed in the tables opposite. Ask your authorized Columbia-Hallowell dealer for details.

Or write Columbia-Hallowell Division, SPS, Jenkintown 11, Pa. or SPS Western, Santa Ana, Calif.

SAVINGS IN INITIAL BUILDING COSTS
(per 100 sq. ft. of storage space eliminated)

% floor space saved by ERECTOMATIC	Building cost per 100 sq. ft.								
	$700	800	900	1000	1100	1200	1300	1400	1500
5	$ 35	40	45	50	55	60	65	70	75
10	70	80	90	100	110	120	130	140	150
15	105	120	135	150	165	180	195	210	225
20	140	160	180	200	220	240	260	280	300

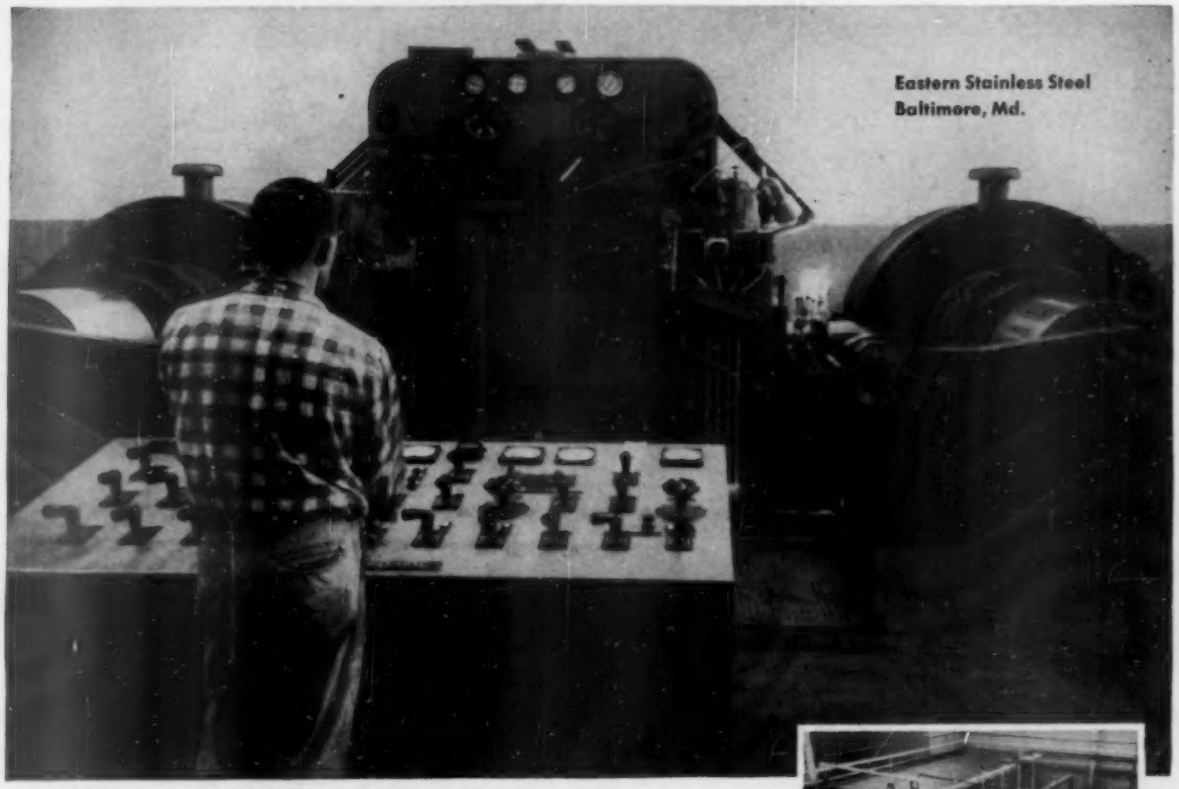
SAVINGS IN ANNUAL COST
(per 100 sq. ft. of storage area saved)

% floor space saved by ERECTOMATIC	Cost (per year) per 100 sq. ft.									
	$100	200	300	400	500	600	700	800	900	1000
5	$ 5	10	15	20	25	30	35	40	45	50
10	10	20	30	40	50	60	70	80	90	100
15	15	30	45	60	75	90	105	120	135	150
20	20	40	60	80	100	120	140	160	180	200

SPS **Jenkintown • Pennsylvania**

Standard Pressed Steel Co. • The Cleveland Cap Screw Co. • Columbia Steel Equipment Co. • National Machine Products Co. • Nutt-Shel Co. • SPS Western • Standco Canada Ltd. • Unbrako Socket Screw Co., Ltd.

"We put Cities Service through the mill!"



Eastern Stainless Steel
Baltimore, Md.

In Eastern's Sendzimir mill, Cities Service Pacemaker Oil plays dual role—general lubricant and rolling oil

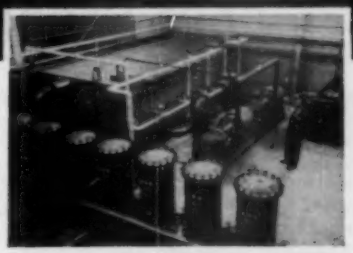
Long a major producer of flat rolled stainless steels, Eastern Stainless Steel recently took another step forward with the installation of a Sendzimir rolling mill.

With this unusual mill, Eastern can roll 700 feet of steel per minute, up to 49 inches wide. What's more, a roll of steel can be reduced from ¼" thickness to .003" thickness!

Needless to say, the pressure and heat generated by this unusual machine create a formidable lubrication job—but it's all taken in stride by Cities Service Pacemaker "O" Oil. Eastern found this one lubricant can play a *dual role* . . . is ideal as a rolling oil and also for bearings and general lubrication.

Pacemaker "O" qualifies for this double role for these reasons: Fully fortified against oxidation, rust, and foaming it combines friction reducing properties with high rate of flow . . . is pumped at the rate of 1000 gallons per minute. "Thanks to this versatility and combination of desirable properties, we've found the oil highly satisfactory and helpful in overcoming some of our problems," says Eastern. "It is a fine lubricant."

If you're looking for lubrication that's more than merely adequate—the kind of lubrication that pays its own way in reduced downtime—get a free lubrication survey from a Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.



11 Oil Filters help assure purity of Cities Service Pacemaker Oil. Oil's excellent anti-rust, anti-foam properties plus rapid rate of flow make it ideal for rolls and general lubrication.

3750 H.P. Electric Motors develop the tremendous power required to drive Eastern's Sendzimir mill. Mill uses 35,000 gallons of Cities Service Pacemaker Oil, cooled by water drawn from pond outside.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

For more facts Circle 467 on Reader Service Card

JENKINS PRACTICAL PIPING LAYOUTS

82

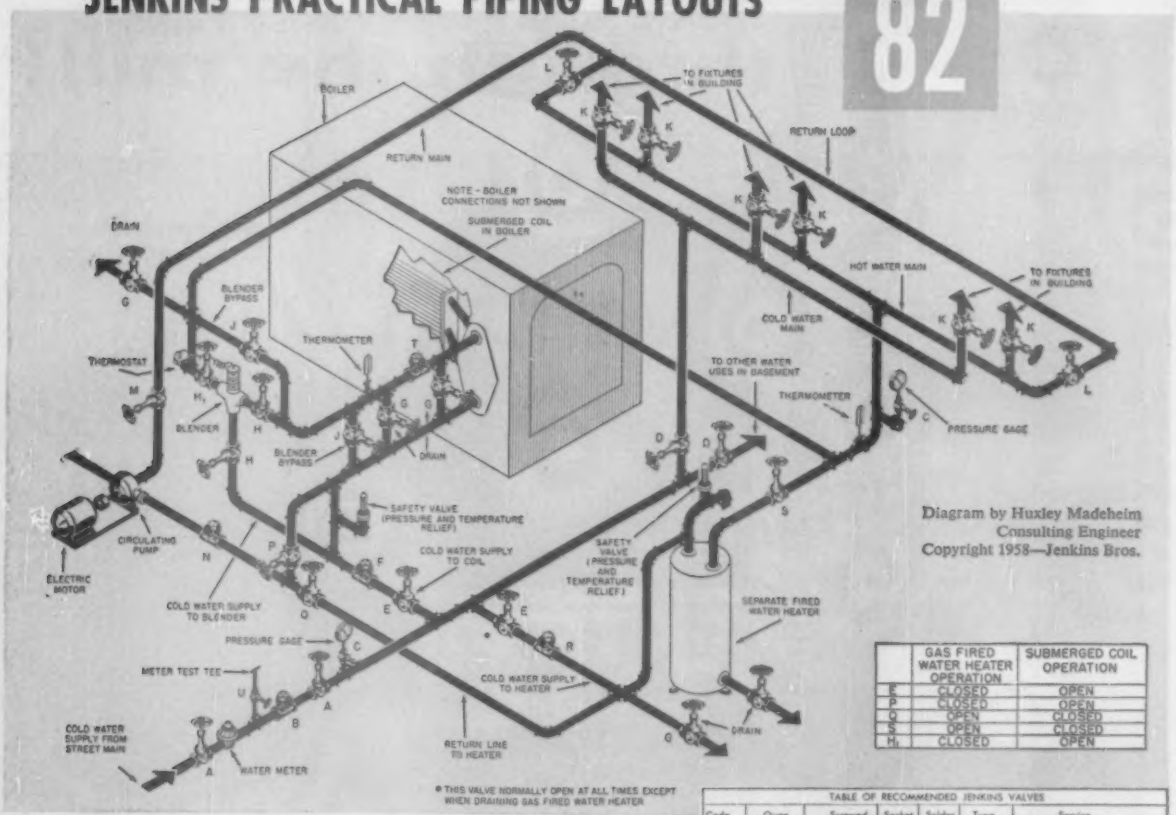


Diagram by Huxley Madeheim
Consulting Engineer
Copyright 1958—Jenkins Bros.

	GAS FIRED WATER HEATER OPERATION	SUBMERGED COIL OPERATION
E	CLOSED	OPEN
P	CLOSED	OPEN
Q	OPEN	CLOSED
S	OPEN	CLOSED
H_1	CLOSED	OPEN

* THIS VALVE NORMALLY OPEN AT ALL TIMES EXCEPT WHEN DRAINING GAS FIRED WATER HEATER

How to plan piping connections for

A HOT WATER SUPPLY SYSTEM

using both Submerged Coil and Separate Water Heater

Continuous hot water for general use is a requirement of many small office buildings, taxpayers, stores, and sections of multi-story buildings. In this layout, two conventional methods of supplying hot water are shown in combination, assuring continuous supply throughout the year with a minimum investment and maximum convenience.

A submerged coil utilizes as a heat source the main boiler whose primary function is to furnish heat for the building. A separately fired heater is employed to provide continuous hot water should the main boiler be shut down during the non-heating season or for maintenance. Connections to both units of hot water generating equipment are arranged so that change-over involves only the operation of valves. The distribution system shown incorporates a circulating pump and return loop, to guarantee hot water at the fixtures at all times.

A Blender valve with the submerged coil permits tempering water to desired temperature, and is equipped with bypasses to permit blender maintenance and emergency repairs without a shutdown. The separately fired heater has its own thermostatic control, so does not require a blender valve.

Safety valves protect both hot water generators. These valves are installed without shutoff to prevent damage and especially damage from possible steam generation in the separately fired heater. Also, it is recommended that cold water admission valve "E" to this heater be left open at all times, except when draining heater, to prevent formation of a vacuum or burning of heater if evaporated dry.

Bronze valves are used throughout because they give best service with most conditions of city water. All gate valves are of the traveling spindle type, which indicate position of wedge.

Jenkins Fig. 106-A screwed end bronze globe valve, (or its equivalent Fig. 1270 with socket ends, or Fig. 1270 with solder ends), is used extensively throughout this piping layout. Its renewable composition disc assures drop-tight closure, and it incorporates many other design and construction features which mean economical maintenance and long, trouble-free life.

TABLE OF RECOMMENDED JENKINS VALVES

Code	Quan.	Screwed	Socket	Solder	Type	Service
A	2	Fig. 47-U	1273	1242	Gate	Shutoff Cold Water Supply
B	1	Fig. 92-A	1272	1222	Check	Prevent Backflow to Main
C	2	Fig. 743-G			Needle	Control Pressure Gage
D	2	Fig. 47-U	1273	1242	Gate	Shutoff Cold Water Dist. System
E	2	Fig. 106-A	1270	1200	Globe	Control Cold Water Supply to Heaters
F	1	Fig. 92-A	1272	1222	Check	Prevent Backflow from Coil to Main
G	5	Fig. 106-A	1270	1200	Globe	Control Drains
H	3	Fig. 47-U	1273	1242	Gate	Shutoff Blender
J	2	Fig. 106-A	1270	1200	Globe	Control By-pass about Blender
K	o*	Fig. 106-A	1270	1200	Globe	Control Water Supply to Individual Fixtures
L	2	Fig. 106-A	1270	1200	Globe	Control Flow through Return Loop
M	1	Fig. 47-U	1273	1242	Gate	Shutoff Suction Circulating Pump
N	1	Fig. 92-A	1272	1222	Check	Prevent Backflow through Circulating Pump
P	1	Fig. 106-A	1270	1200	Globe	Control Flow Return Water to Coil
Q	1	Fig. 106-A	1270	1200	Globe	Control Flow Return Water to Heater
R	1	Fig. 92-A	1272	1222	Check	Prevent Backflow from Heater to Main
S	1	Fig. 47-U	1273	1242	Gate	Shutoff Hot Water Supply from Heater
T	1	Fig. 92-A	1272	1222	Check	Prevent Backflow through Coil
U	1	Fig. 106-A	1270	1200	Globe	Control Meter Test Line

*Dependent on quantity of fixtures.

To assure efficiency when planning a major piping installation, consult with accredited piping engineers and contractors, and select valves from the Jenkins Catalog.

FREE enlargement of this layout No. 82 sent on request to Jenkins Bros., 100 Park Ave., New York 17.

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
JENKINS SINCE 1864
Jenkins Bros.

Sold through Leading Distributors Everywhere

A-W Hydraulic Crane handling 3-ton pallet of strip steel in storage yard of Superior Tube Company, Collegeville, Pa.

Speedy Austin-Western Hydraulic Crane cuts materials handling costs at Superior Tube

Two years ago, Superior Tube Company, Collegeville, Pa., "The Big Name in Small Tubing," bought an A-W Hydraulic Crane primarily to handle strip coils, steel billets and box lumber.

Elmer W. Maul, shop foreman, reports: "We formerly had to unload the strip coils from trucks by hand, a tough, backbreaking job that took six men 5 or 6 hours to do. Each truckload of coils weighed about 30 tons, with the individual pallets running about 3 tons. To reduce handling, the coils were stored inside the building in a 1200 sq. ft. area, where an overhead crane could deliver them for fabrication.

"Using the A-W crane, two men can now unload a truck in an hour, and the coils can be stored outside, giving us this inside storage area for other purposes. As the coils are needed, the A-W picks them up, and takes them inside for delivery by the overhead crane.

"In the past, we had our steel billets shipped in by rail. They arrived at a spur about 1¼ miles from the storage area, and it took a full day to unload a gondola with a truck crane renting for $60. We now get shipments by truck which can be unloaded by the A-W in only 3 hours. Furthermore, the crane has enabled us to double our storage capacity without increasing the area by the use of stacked storage bins for various sizes of billets.

"Box lumber was also shipped in by rail. To unload and store this, we rented a truck crane at a flat rate of $225 for the 16-hour job. Today we have it brought in by truck, and the A-W unloads and stores it in an hour.

"We are constantly finding new uses for our A-W crane. It has served us well wherever there is a job that needs muscle, and we consider it an excellent investment."

The A-W crane can speed your materials handling and save you money. There is a representative nearby who will gladly arrange a demonstration and show you how. Get in touch with him today . . . or write direct.

Austin-Western CONSTRUCTION EQUIPMENT DIVISION, AURORA, ILL.

BALDWIN · LIMA · HAMILTON

Power graders • Motor sweepers • Road rollers • Hydraulic cranes

For more facts Circle 469 on Reader Service Card

REPUBLIC STEEL LOCKERS

BONDERIZED for "He-man" Service

Republic Steel Lockers stand up under toughest conditions of "he-man" service. Made of cold-rolled heavy-duty steel, Republic Lockers offer many advantages in durability, efficiency, convenience, protection.

Republic Steel Lockers are Bonderized. This Republic feature provides a superior base for the baked enamel finish . . . protects against rust and corrosion . . . restricts damage due to bumps, scratches, and abrasion of every day service to the site of the injury . . . reduces maintenance costs to a minimum . . . helps build employee morale.

Plan your new or expanded dress-wash-and-change facilities around Republic Steel Lockers. Republic's Berger Division knows how to build the locker quality you need at a competitive price. Call your Republic-Berger representative, or send coupon for facts.

For more facts Circle Reader Service Card numbers as follows:

REPUBLIC METAL LUMBER® is a new idea for making special purpose tables, stands, catwalks, racks, scaffolds. It's Republic's Berger Division's new slotted construction angle. Simply plan your assembly, cut METAL LUMBER, join with bolts. Horizontal and vertical slots make adjustment easy. Bonderized and finished with gray baked enamel after fabrication. Shipped in convenient bundles of 10 angles, 10- or 12-foot lengths. Stores in same space as one 2" x 4" piece of lumber. Write for catalog.

REPUBLIC'S "KNOW-HOW" SOLVES FABRICATION PROBLEM. Continental Can Company, Chicago, wanted a specially constructed "torture" chamber of rack-type shelving with sliding shelves to accommodate a variety of can sizes and types to weather severe changes in temperature. Republic's Berger Division solved the problem through its contract manufacturing facilities and equipment. In Berger plants many sheet steel products are fabricated for other customers and marketed under the manufacturer's brand name. Republic's fabricating "know-how" provides you with the same high quality you see in Berger Division products—lockers, office furniture, shelving, and steel kitchens. Send a sketch or blueprint with complete specifications. Berger will tell you promptly what their specialized services can do for you.

REPUBLIC MATERIALS HANDLING SPECIALISTS engineered these steel boxes to the exact requirements of the Kropp Forge Company, Chicago, Illinois. Special features include corrugated construction for extra strength, a smooth channel around the top to eliminate dangerous sharp edges, four-way fork channels to simplify handling, and stacking brackets welded to top corners to permit tiering to any practical height. As a result, these boxes save time, space, and money in handling and shipping operations. New materials handling ideas from Republic may help you gain similar advantages. Send coupon for facts.

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World's Widest Range of Standard Steels and Steel Products

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1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send more information on the following:

- ☐ Republic Steel Lockers
- ☐ Republic Fabricating Facilities
- ☐ Materials Handling Equipment ☐ METAL LUMBER

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

"Sweet little money-maker... before we put the wheels on!"

Funny joke! But the boss is not amused.

His company supplies the body of that cart to other manufacturers — successfully, too. Just recently he decided to market a model of his own, complete with wheels. Yes . . . they're selling fast. But the company's losing money on every shipment.

What happened? With late and inadequate cost reports on that wheel assembly, the price was set too low. Weeks passed before the boss found out. And it'll be weeks more before his profits stop taking a licking.

How different with Automatic Keysort punched-card controls! With Keysort's meaningful *on-time* job-cost summaries, management would have known how costs were running at every stage . . . could have acted *fast* to keep them in line. Thus, price could have been set to *cover* cost . . . and the new product marketed with a healthy profit included.

Automatic Keysort is today's only data processing system that provides automatic creation and processing of original records. Speeding vital day-to-day and long-range facts essential to sound management, this unique system employs simplified machines and methods which can relieve your personnel from many routine clerical functions.

With the Automatic Keysort System, manufacturing concerns of every size can now enjoy fast, accurate data processing on either a centralized or decentralized basis. At remarkably low cost . . . without restrictive, complex procedures . . . without specialized personnel.

Call your nearby Royal McBee Data Processing Representative, or write Royal McBee Corporation, Data Processing Division, Port Chester, N. Y. for illustrated brochure F-2.

ROYAL McBEE · *data processing division*

NEW CONCEPTS IN PRACTICAL OFFICE AUTOMATION

For more facts Circle 474 on Reader Service Card

For more facts Circle 475 on Reader Service Card ➤

There's NO other truck like AUTOMATIC'S NEW DYNAMOTIVE

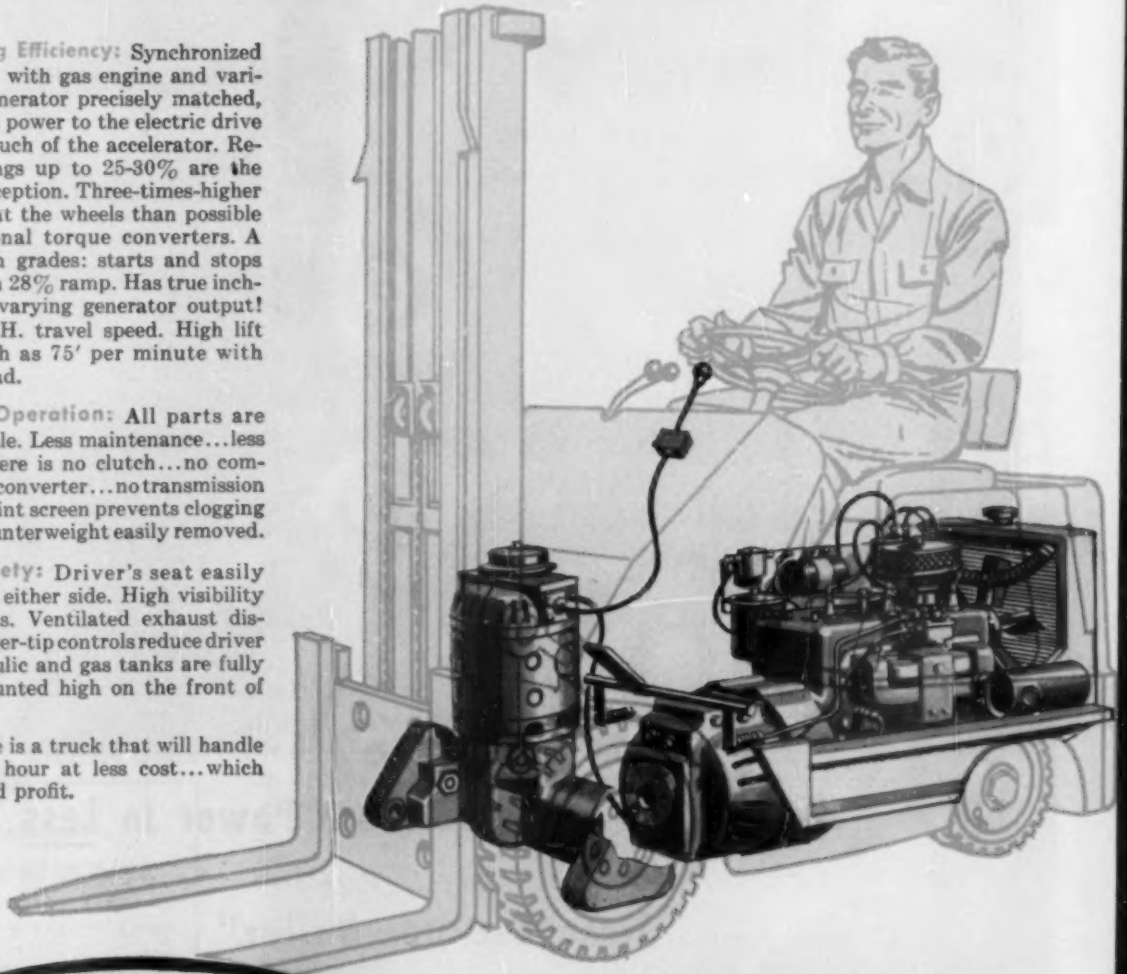
Offers the ultimate in High Operating Efficiency ...Low Cost of Operation...and Maximum Safety

High Operating Efficiency: Synchronized power package, with gas engine and variable voltage generator precisely matched, supplies instant power to the electric drive motor at the touch of the accelerator. Results: gas savings up to 25-30% are the rule, not the exception. Three-times-higher torque output at the wheels than possible with conventional torque converters. A power house on grades: starts and stops with full load on 28% ramp. Has true inching ability by varying generator output! Fast, 8.5 M.P.H. travel speed. High lift speed; as much as 75′ per minute with 4,000 pound load.

Low Cost of Operation: All parts are readily accessible. Less maintenance...less down time. There is no clutch...no complicated torque converter...no transmission ...no trouble. Lint screen prevents clogging of radiator. Counterweight easily removed.

Maximum Safety: Driver's seat easily accessible from either side. High visibility in all directions. Ventilated exhaust dispels fumes. Finger-tip controls reduce driver fatigue. Hydraulic and gas tanks are fully protected—mounted high on the front of the truck.

In short, here is a truck that will handle more tons per hour at less cost...which means increased profit.



Savings are dynamic with the new Automatic® DYNAMOTIVE

AUTOMATIC TRANSPORTATION COMPANY
WORLD'S LARGEST EXCLUSIVE BUILDER OF ELECTRIC-DRIVEN INDUSTRIAL TRUCKS
Division of The Yale & Towne Manufacturing Company
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Get all the facts on this completely different truck. Dynamotives are available in capacities from 4,000 to 10,000 lbs. with cushion tires, and 4,000 to 6,000 lbs. with pneumatic tires. Write today for new bulletin!

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☐ Please mail me complete information on the new Automatic Dynamotive.
☐ Explain convenient plans for lease or purchase of Automatic industrial trucks.

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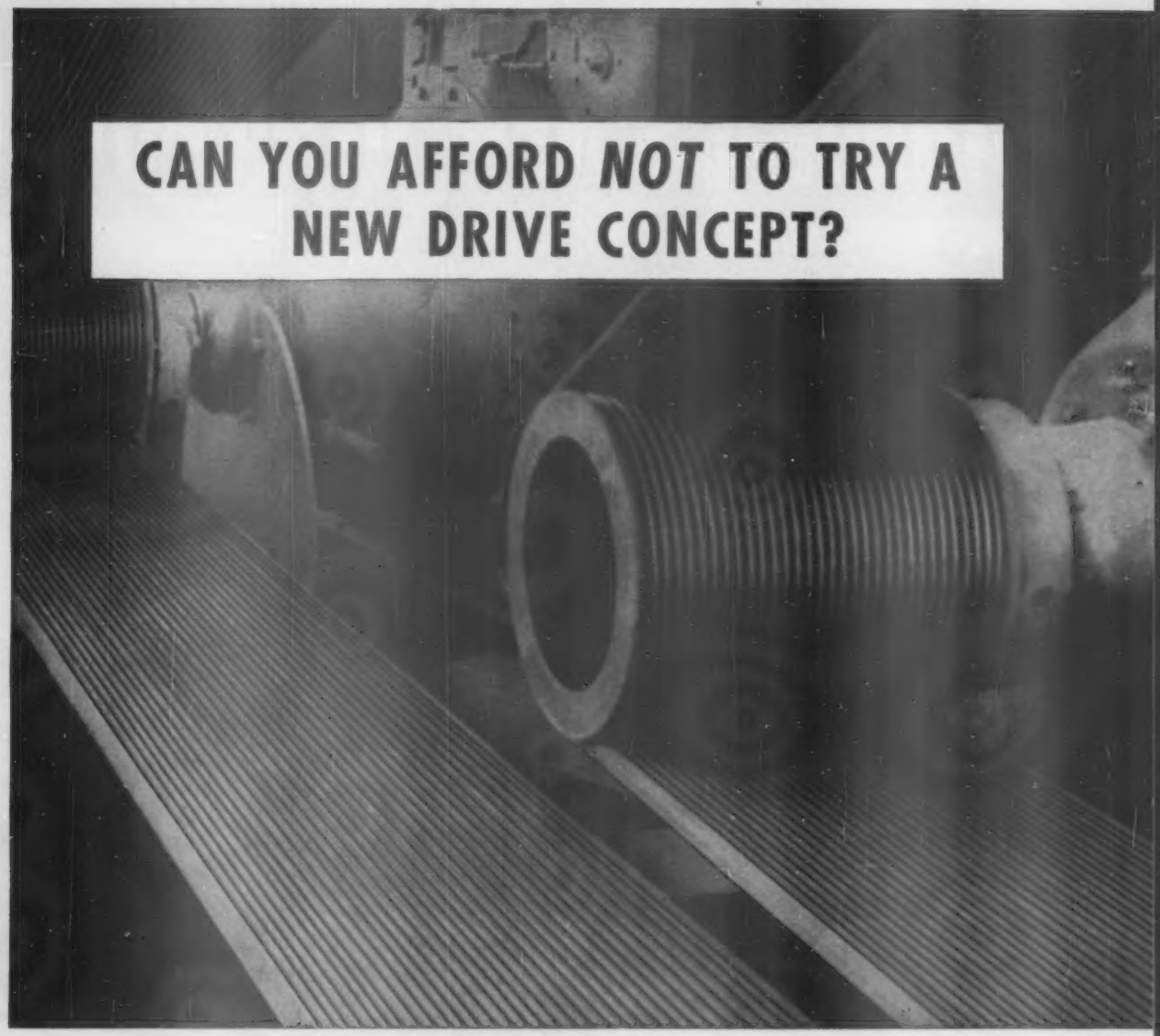
Firm Name_____
Address_____
City & Zone_____ State_____



R/M Poly-V® Drive Delivers More Power in Less Space

. . . "More Use for Your ~~per~~ Dollar"

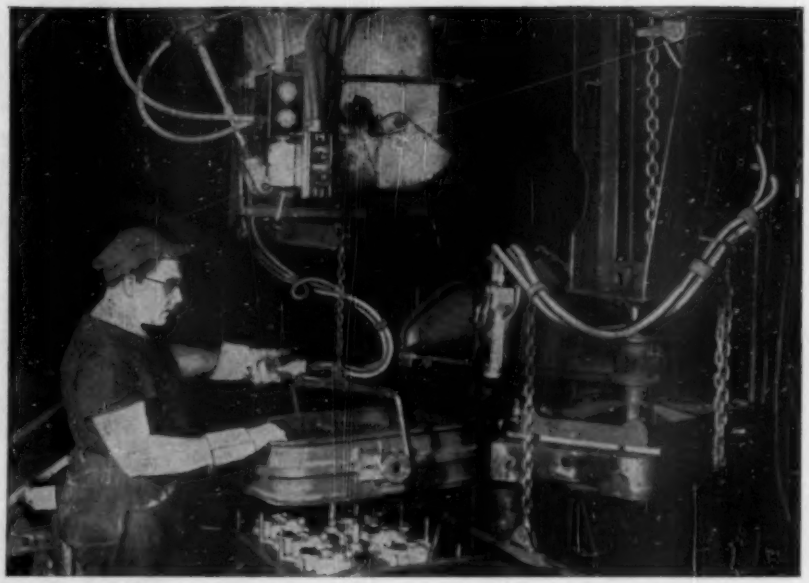
Patented new design gives Poly-V Drive up to 50% more power capacity than a conventional V-drive of equal width . . . equal power in as little as 2/3 the width! Single unit V-ribbed belt permits *narrower drive sheaves . . . less shaft overhang . . . less drive weight.* Drive features add up to a new standard in trouble-free drive performance never before possible for heavy duty power driven equipment.

- **Eliminates Multiple-Belt "Length Matching" Problems**
- **Maintains *Constant* Speed Ratios — *No* Load to *Full* Load**
- **Less wear on belt and sheaves**
- ***Two* Belt Cross Sections Meet *Every* Heavy Duty Power Requirement**
- **Reduces Belt *and* Sheave Inventories to a Minimum**

Investigate advantages of *new* Poly-V* Drive for your application. Write for Bulletin #6638 . . . or discuss your requirements with an R/M representative.

*Poly-V is a registered Raybestos-Manhattan Trademark.

For more facts Circle Reader Service Card Numbers as follows:



ALLFLEX HOSE — First hose of its type for all-purpose use with air, water, oil, gases—even mild chemicals. Strong, yet light and kinkless. Flexible, has no pre-set twist—coils and uncoils *in any direction*. Write for Bulletin #7075.

RAY-MAN CONVEYOR BELT — Double compensation relieves stress of outer plies, assures longer life for handling bulk materials. Tough, flexible, resists gouging and tearing. High fastener holding ability. Types available for heat, oil, static resistant use, package and table-top installations. Write for bulletins.

50% LESS OVERHANG For Less Drive Weight—Less Space.
PITCH
LINE
UNVARYING PITCH Diameter.
Poly-V cannot sink in the grooves under shock load.

RM616

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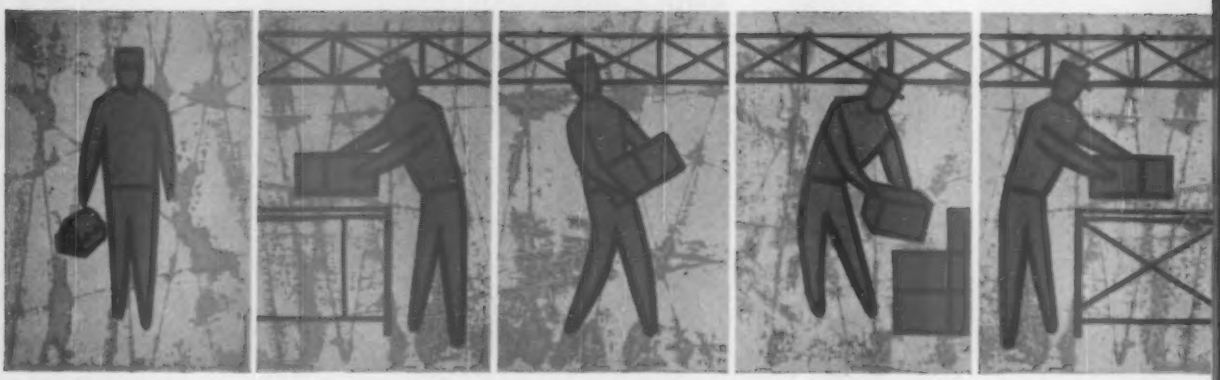
RAYBESTOS-MANHATTAN, INC.

Other R/M products: Abrasive and Diamond Wheels • Brake Blocks and Linings • Clutch Facings • Asbestos Textiles • Mechanical Packings • Engineered Plastics • Sintered Metal Products • Industrial Adhesives • Laundry Pads and Covers • Bowling Balls

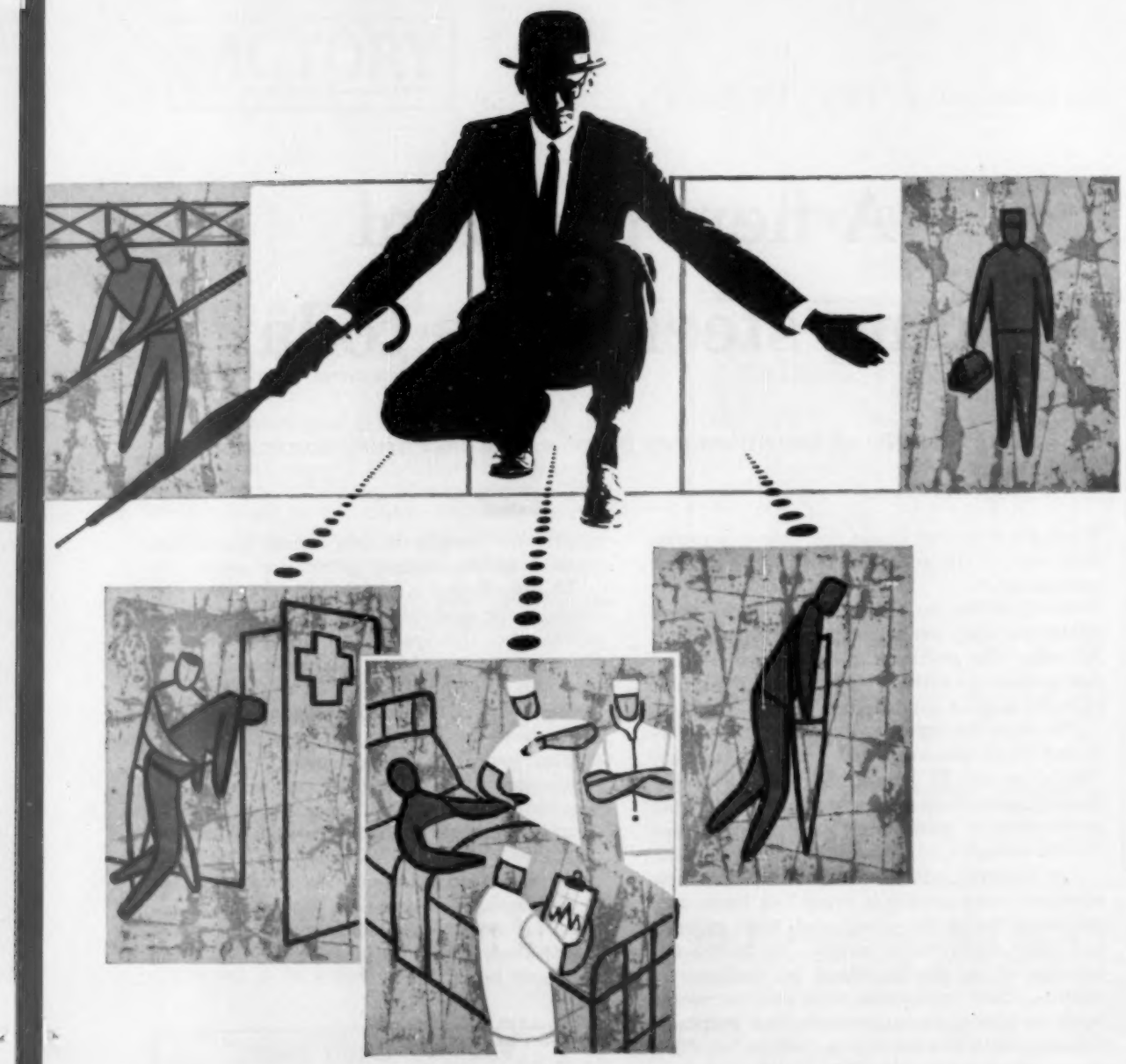
476 Poly V-Drives, 477 Hose, 478 Conveyor Belt



This friendly AM man helps injured plant employees recover faster... return to work sooner!

Getting injured employees back to work as soon as possible helps avoid personal hardship for them . . . and financial loss for the plant.

Designed to do this is American Mutual's Job Restoration Plan. Included is pre-accident planning in the plant to make sure that the injured receive proper first aid and immediate medical attention. Also provided are the services of AM's Staff Doctor Organization (over 4,000 industrial physicians and surgeons in the U. S.), AM's Consulting Staff of leading medical specialists, and the use of vocational training centers near the injured's home. All these services are coordinated by AM men who keep in close touch with the injured person and his employer until he's back at work.



This program has helped thousands of employees regain their earning power . . . has improved community relations, kept work schedules up and insurance costs down for AM policyholders.* Good reasons to see your *friendly* AM *man* now! American Mutual, Department FM-6, Wakefield, Massachusetts.

*The Lionel Corp., another policyholder of the AM Companies, saved $103,301 on insurance costs in 7 years through good safety experience . . . gained another $134,883 through AM mutual dividends.

American Mutual

LIABILITY INSURANCE COMPANY

Your friendly AM man can advise you on all your liability insurance needs

Leading writers of Workmen's Compensation, all forms of Liability, Crime, Accident and Health Insurance

A new problem facing steel users today

The danger of losing money by relaxing inventory controls

When the slump set in last year, big inventories were one of the toughest problems for most companies.

Now, as the economy swings back, these problems may seem to have disappeared. Actually, the problems of inventory cost and risk are always with us—just as much a threat to profit in good times as in bad.

But with the urgency of strict economies reduced, there is a very real danger that many companies will be caught off guard—a danger that recession-born practices will be abandoned as temporary emergency measures without careful enough analysis of their profit potential.

For example, companies that modified their steel inventory policies to avoid long-term commitments found that many costs were reduced and their needs better served. By taking advantage of the stocks offered by steel-service centers, these companies were able to release working capital for more productive purposes, free valuable storage space, reduce handling costs and lower scrap losses, insurance taxes, etc.

Proof in dollars and cents

Those who carefully weighed all the advantages found reason for a *permanent* modification of their previous buying practices. They proved to themselves that they could and should rely much more heavily on steel-service centers because it makes sense in dollars and cents.

This conclusion is especially sound when you consider the unusually broad scope of Ryerson stocks and the speed and dependability of Ryerson services. Any kind, shape and size of steel can be shipped to you from Ryerson in a matter of hours. And your steel can be furnished in ready-to-use form, saving time and initial-cutting cost. You gain complete flexibility to meet quick shifts in production schedules. And you have the added assurance of getting steel of uniform, high quality—the unequalled dependability of Ryerson *certified* quality.

Your Ryerson representative is well qualified to review the facts and help you get the maximum value for your steel buying dollars. Ask him to analyze your requirements with you the next time he calls.

What it costs to carry inventory

IRON AGE magazine says: "*A survey of eight plants shows that, for every $100 worth of materials bought, the average yearly inventorying cost is $19.37.*"

Other authorities say the real cost of steel placed in inventory for extended future use may be as high as 40% more than the invoice price.

RYERSON STEEL®

Member of the INLAND® Steel Family

***Principal Products:** Carbon, alloy and stainless steel—bars, structurals, plates, sheets, tubing—aluminum, industrial plastics, metalworking machinery, etc.*

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • WALLINGFORD, CONN. • PHILADELPHIA • CHARLOTTE • CINCINNATI • CLEVELAND DETROIT • PITTSBURGH • BUFFALO • INDIANAPOLIS • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

FACTORY
MANAGEMENT AND MAINTENANCE
. . . PRESS TIME REPORT • DECEMBER 1958

Looking Ahead in Business

Spending for new plant and equipment is heading up again after the sharpest cutback since World War II. That's the key finding of the latest McGraw-Hill survey of investment plans for '59 and '60.

Current plans show an increase of 0.5% next year. Advance plans for '60 are about the same. This means total outlay of $33-billion for all industry—$9.7 for manufacturing, $5.4 for petroleum, $6.1 for gas and electric utilities, $7.0 for commercial firms, balance for mining, rails, communications.

•

A second look at the survey results indicates two things about the trend in capital expenditures:

Spending next year probably will be higher than now planned, since many companies have not yet revised their '59 budgets. For example, in the fall of '54 companies planned to spend some 5% less on new plant and equipment in '55. By the spring of that year plans were revised to show a 5% increase. Actual spending was 7% higher than in '54. As was true then, we are now in the middle of an upward revision of plans.

Current plans do not indicate a return to the '57 investment peak. This year's cutback was 15%. Budgets for 1960-61 would have to soar for capital spending to hit a new high.

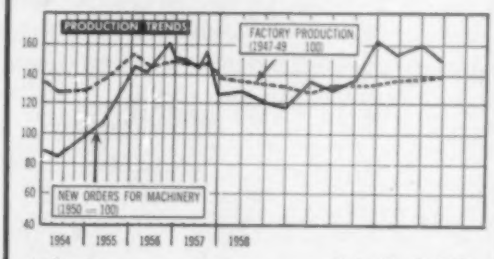
•

Right now the revision is spotty—especially in manufacturing, where recession hit hardest and there's excess capacity. Manufacturing plans to spend 3% less in '59, on top of this year's 27% drop.

What's more, many basic industries are still weak (e.g., non-ferrous metals off 22%; iron and steel, 13%; chemicals, 8%). But machinery companies plan to spend 1% more than in '58. Food, rubber, autos, and stone, clay, and glass companies plan increases ranging from 4% to 20%.

The real strength comes from non-manufacturing industries. Oil industry plans are up 6%; chain stores, banks, and insurance companies, 4%. Utilities are cutting back slightly, but only because of record expansion this year in spite of recession.

FACTORY FIGURES OF THE MONTH



Indicator	Oct. 1958	Sept. 1958	Oct. 1957
New Orders for Machinery (exc. elec.)[1]	150.8*	160.0	125.0
Contracts for Industrial Construction[2]	75.8*	76.2	117.2
Factory Production[3]	140.0P	139.0	143.0
Consumers' Prices (cost of living)[4]	123.6*	123.7	121.1
Industrial Prices (materials, supplies)[4]	126.4	126.2	125.8
Manufacturing Employment (millions)[4]	15.6	15.7	16.8
Total Employment (millions)[5]	65.3	64.6	66.0
Unemployment (millions)[5]	3.8	4.1	2.5

P = preliminary r = revised * = estimate

Sources: 1. McGraw-Hill Dept. of Economics (1950 = 100); 2. Engineering News-Record (1950 = 100); 3. U. S. Federal Reserve Board (1947-49 = 100); 4. U. S. Dept. of Labor, Bureau of Labor Statistics (1947-49 = 100); 5. U. S. Dept of Commerce, Bureau of the Census.

Nearly all industries expect bigger sales in '59. The McGraw-Hill survey shows manufacturers expect a 9% gain; steel and autos, over 20%.

It will take this much to wipe out the excess capacity in many industries. With capacity 50% higher than in 1950, most companies are now running below 80%—even with the recent spurt.

Until the operating rate reaches 85% or better, major emphasis will be on modernization and replacement, not expansion. Recent issues of FACTORY have pointed out the possibilities for this kind of investment. And the McGraw-Hill survey indicates industry is stepping up its efforts in this area.

•

The important point: Capital investment will be a plus in '59. Add this to rising consumer spending, the rebuilding of inventories, and increases in government spending, and it's clear that the trend is up substantially as we move into '59.

Ideas of the Month

(For more information, circle item numbers on Reader Service Card next to back cover)

How does your pension plan stack up? Here's your chance to compare. "Facts and Trends in Pension Planning" is a 44-page report (*Connecticut General*) that analyzes 600 group plans in 26 major industries. **(311)**

Corrugated steel platforms that have formed-in knee braces (*Powell Pressed Steel*) will take loads that cause other platforms to fold. **(312)**

What lighting fixture for you? Consult that new loose-leaf catalog (*Lighting Dynamics*). A lasting reference source. 168 pages. **(313)**

Radiographic inspection becomes a one-man job with a 58-lb. isotope machine (*Picker X-Ray*) that packs in a case no bigger than an overnight bag. Can be operated with either Iridium 192 or Thurium 70. **(314)**

Calendar-of-the-Year is a handy-dandy 4-pager (*Hinde & Dauch*). Not for detailed appointments. But swell for the long look-ahead. You see 6 months at a glance. We've used one like it for years. **(315)**

Best markers we've seen for storage areas, bays, etc., are 3-in.-high aluminum foil numbers and letters (*Brady*). Self-stickers, of course. **(316)**

Booklet-of-the-Month is a 24-page handbook on "Pallet Handling in Narrow Aisles" (*Raymond*). Answers all your questions about pallets, unit load handling, use of air rights, space-saving benefits, trucks available. **(317)**

Electric ear is a sound-level recorder (*Hardinge*) that will regulate feed rate to grinding mills, increase production 10 to 20%. **(318)**

Did you know worn or burned-out mercury lamps could be reconditioned? New process (*Quartz Radiation*) restores to original efficiency. **(319)**

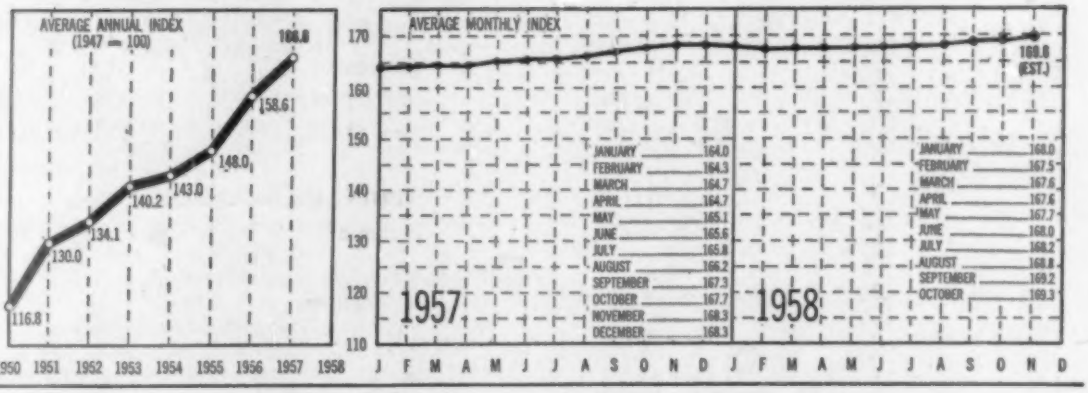
ToroPak is a portable unit (*Francis Bros.*) that supplies 110-volt, 60-cycle, single-phase power up to 200 watts continuous output for 8 hours. **(320)**

Newest Hypressure Jenny (*Homestead Valve*) gives you your choice of eleven steam-hydraulic cleaning actions, assuring correct pressure and gallonage for the job at hand, plus no power wastes. **(321)**

More Ideas of the Month on pages 96 and 97

FACTORY
MANAGEMENT AND MAINTENANCE
. . . PRESS TIME REPORT • DECEMBER 1958

Cost Index of Plant Maintenance



Cost Index Edges Up Again

Growing industrial demand for labor and materials means bigger cost increases.

FACTORY'S Maintenance Cost Index is now scheduled to go higher at a somewhat faster pace in the next few months than it did in the month of October. Forward estimates of materials and labor costs place the Index at a level of 169.6 for November and at 170 for December.

Industrial activity is bouncing back faster than most of the experts anticipated earlier. This means that the operating rate of the manufacturing industry, on the average, has already topped 80% and is now moving up to 85%. Soon the excess capacity of companies will have shrunk so that over-capacity will no longer act as a brake on costs of materials. The current excess of manpower also may be over-rated as a brake on costs. Skilled maintenance workers are hard to come by. As business gets better, they will be even harder to get. Result: Wages of maintenance workers will go up.

Between September and October the Cost Index registered an increase of only 0.1, the smallest gain since last spring. Materials costs moved up during October but over-all labor costs held about even.

Of the 39 items in the Index for which costs are obtained, the cost of 14 materials rose, 21 held even and only 4 declined between September and October.

Over-all labor costs showed little change in this period. Cost of construction-maintenance labor rose. But this was offset by a temporary, perhaps seasonal, decline in cost of equipment-maintenance labor.

	AVERAGE 1957	OCTOBER (Preliminary)	SEPTEMBER (Revised)
Building and Facilities Index	156.9	163.0	162.6
Materials	140.6	139.7	139.4
Brick	147.8	149.0	149.0
Elec. fixtures	128.0	128.9	128.9
Elec. switches, boards, fuses	173.7	180.8	180.8
Elec. wire, copper	136.6	127.1	123.7
Glass	152.6	151.5	151.5
Gutters, spouts, ducts	169.4	177.1	175.7
Gypsum products	134.5	140.8	140.8
Heating equipment	128.2	127.4	127.5
Lumber	126.7	120.8	121.0
Millwork	147.1	130.5	127.6
Paint	128.1	130.0	130.0
Pipe, cast iron	165.8	170.4	170.4
Pipe, steel	188.1	195.8	195.8
Pipe & tubing, copper	156.0	144.1	142.7
Roofing	129.8	127.7	127.7
Sanitary fixtures	151.4	147.8	147.0
Sash, metal frame trim	145.7	145.2	145.2
Solder	121.2	100.8	98.8
Steel, structural	222.0	236.3	236.3
Tanks, steel	138.3	138.1	137.5
Valves & fittings	159.9	162.7	160.7
Wire mesh	166.9	161.9	162.9
Labor	167.7	178.5	178.0
Carpenters	154.6	163.1	163.1
Electricians	174.5	188.7	187.7
Painters	174.0	183.8	183.2
Equipment Index	169.9	172.1	172.0
Materials	167.7	169.7	168.8
Abrasives	154.1	160.4	160.4
Alloys, non-ferrous	127.2	121.9	115.8
Bars & plate, steel	214.8	227.2	227.2
Bearings	166.2	160.3	160.3
Belting	150.9	150.2	150.2
Bolts, nuts & screws	222.9	228.7	230.0
Chain	177.6	184.0	184.0
Controls (electrical)	175.7	180.8	180.8
Gear-reduction units	180.4	181.7	181.7
Hand tools, mechanics	185.1	193.0	192.3
Lubricants	87.8	80.1	80.1
Motors	143.5	148.4	148.4
Non-ferrous metals	133.3	125.2	117.8
Precision tools	150.2	153.2	153.2
Pumps	177.2	183.5	183.2
Tools, cutting	162.3	164.9	161.0
Valves & fittings	159.9	162.7	160.7
Labor	171.5	173.7	174.1
All mfg. labor	167.5	172.2	173.1
Machine tool labor	175.4	175.1	175.1
FACTORY'S COST INDEX	166.0	169.3	169.2

FACTORY
MANAGEMENT AND MAINTENANCE
. . . PRESS TIME REPORT • DECEMBER 1958

Looking Ahead in Labor

What are labor's chances with the liberal 86th Congress? In a nutshell—not so good as they look.

When the new Congress opens its doors next month union officials will file in with a host of demands for new laws—social, economic, and labor. But these two will count above all others:

. . . *Revision of Taft-Hartley—particularly a federal ban on state "Right-to-Work" laws.*

. . . *A moderate reform bill, limited to democratic controls over union officers and funds.*

•

Action on either of these would mean a big labor year. But AFL-CIO President George Meany talks both. And to support the demands union lobbyists will have some concrete figures about labor's part in the new Congress: that labor backed 25 out of 32 winning Senators, 70% of House winners.

And this isn't all. For instance, the Textile Workers Union is spotting the voting line-up to get action on its proposals for depressed areas, including textile communities. The union count shows this: Of the 47 House seats newly captured by the Democrats, 24 are in labor-surplus areas. Same for 10 newly elected Senators. These will be the textile union's pressure points.

•

Such is the union political strategy. But even with a large liberal line-up the score won't be so high as you might expect. Here are the prospects:

. . . *Taft-Hartley revision.* Still a hot potato. Prying it open in Congress would require concentrated effort by labor unions.

. . . *Labor reform.* Defeated last year. This is where the election makes the switch. Labor may get the anti-corruption measure it wants.

. . . *Depressed areas, minimum wage hike, and others.* Some demands will pass, others be traded off. But the unions will not come close to their over-all goals. For instance, they want a $1.25 minimum wage and coverage of retail trades. They might get the latter, but not both.

Why the modest prospects for labor in Congress? Among the most important reasons are these:

. . . *The corruption shadow still hangs over the unions.* They have just gone off the defensive. The turn-around will slow them down.

. . . *Though the Democrats rule Congress the President is a deterrent on labor legislation.* He would veto a ban on state R-T-W laws, might even reject a too-easy labor reform bill.

Labor strategists are well aware of these pitfalls. Privately they'll admit T-H revision doesn't have much chance—especially with labor reform Congress's first major labor topic. But they may use it to trade for a union-control measure they want.

•

It may come as a surprise that a reform bill is a "must" on the labor schedule. Why?

. . . *It would ease up on Congressional racketeering investigations.*

. . . *It would relieve the AFL-CIO's embarrassing position with the Teamsters.* The truck union's ouster from the federation hardly slowed it down. A new reform measure might help.

. . . *Labor wants to be rid of the McClellan anti-rackets committee of the Senate.* Although the committee is slated to go for another year, union lobbyists either will try to prevent another round of hearings or, failing that, they'll push reform legislation as the answer to the need for the McClellan probe.

•

Keep your eye on this: Some business and labor leaders are concerned about the hardening of rival positions on both sides. Harsh public attitudes are setting up armed camps.

This started with economic differences in the recession, grew in the election's R-T-W campaigns. One labor official has proposed a permanent labor-management top-level conference to ease the tension. Otherwise, he says, 1959 is going to be a very bad year for union-employer relations.

SEE LABOR RELATIONS NEWS, PAGE 164

materials-handling news

NEW AND UNUSUAL APPLICATIONS OF BASSICK CASTERS THAT MIGHT BE ADAPTED TO YOUR HANDLING PROBLEMS

Handles 1.25 million lbs. of paper a day

Philadelphia Bulletin's huge new plant uses an infloor dragline system, carts equipped with Bassick casters, to unload, store, and transport one-ton rolls of newsprint. Lewis-Shepard, a leading materials-handling equipment manufacturer, selected Bassick casters for the carts. Casters have to be built for top performance, low maintenance and long life when an expert in the field chooses them. A point worth remembering next time you need casters.

Mother substitute rides casters

Using a caster as the rear landing gear of a decoy, Dr. E. H. Hess, Associate Professor of Psychology at the University of Chicago, studies duck behavior patterns and possible human parallels. The Hess decoys, wired for sound and moving by remote control are used to discover how very early impressions affect duck's later social patterns.

New ideas with casters

Your local distributor who handles Bassick casters can often suggest new ways of moving materials that may save you time or money. He can also recommend the most efficient caster for your specific job and keep you up to date on new caster developments applicable to your operation. Call on him . . . he'll be glad to work with you and, where advisable, call in a Bassick Field Engineer for consultation. 9.43

Casters aid PRODUCIBILITY of Lockheed prop-jet Electra

This short-to-medium-haul aircraft was designed for producibility. It had to be if agreements for performance, price and delivery were to be held firm.

Every production step at Lockheed Aircraft Corporation, Burbank, California, was planned to save time, save materials, save money.

That's why we're especially pleased that so many Bassick casters were used in assembling the Electra . . . and that they were used in so many ways. Typical is the mid-body wing cell, the Electra's central structural member, shown on Bassick casters above.

Keeping costs down on your production job . . . or any materials handling job, for that matter . . . starts with careful planning. And that's the point at which Bassick distributors or Bassick Engineers can help you most. Call on them.

Plant model sectionalized on casters

Sikorsky Aircraft, Division of United Aircraft Corporation has built the scale model of their plant at Stratford, Connecticut, on a sectionalized table. Each section rolls away on Bassick grooved wheel casters to give personnel access to center portions, otherwise hard to get at. With casters operating on inverted angle iron tracks, the sections roll back into exact position. This way you can make a model big enough to work with and yet get inside for close work.

see our catalog in Sweet's or write for copy

THE BASSICK COMPANY
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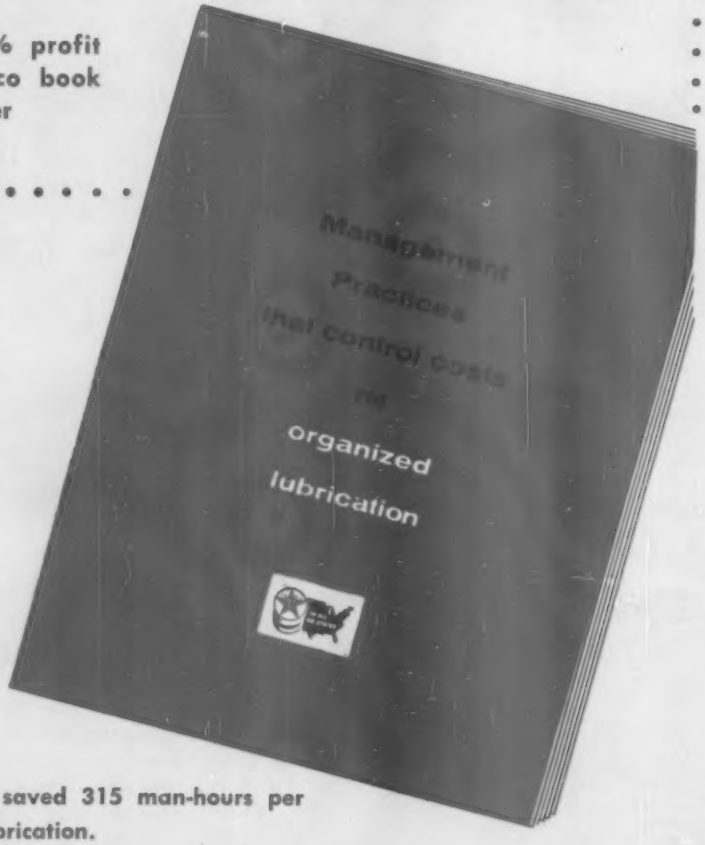
Bassick
A DIVISION OF
STEWART-WARNER CORPORATION

For more facts Circle 481 on Reader Service Card

Neglected area of cost-control-opportunity uncovered by NEW BOOK

Guide to potential 4% profit increase makes Texaco book latest business best seller



Why you need it: The Texaco guide uncovers a new area where management can effect real economies in reduced maintenance costs. This is especially important now that decentralization and generally lower profit margins make the profit-and-loss statement the real measure of each plant unit's management efficiency.

What it will tell you: With facts like these, the Texaco guide shows that organized lubrication can raise production, extend parts life, and cut downtime:

★ **A metalworking manufacturer saved 315 man-hours per month through more efficient lubrication.**

★ **A major corporation anticipates substantial maintenance savings through the services of a lubrication engineer.**

★ **A mill has increased bearing life from 16 to 72 shifts by instituting systematic lubrication that insures the right lubricant for each machine.**

How it will help you: Only organized lubrication gives management such an opportunity for savings. For example, a 10% reduction in maintenance costs through better lubrication methods will increase profits up to 4% in the average plant—more than equivalent to a 4% increase in sales. And Texaco's new guide shows how it may be done.

How to get your copy: Simply fill in the coupon, attach it to your letterhead, and mail it to The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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TEXACO

Please send me Management Practices that Control Costs via Organized Lubrication.

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Title_____

For more facts Circle 482 on Reader Service Card

Needed: Straight Thinking on Productivity

WE HAVE BEEN watching with considerable interest recent government reports about productivity. You have probably seen them, too—Federal Reserve Board figures on production that suggest productivity has zoomed upward during the past 12 months. What seems to make this increase particularly important is that it has taken place during a recession period.

Equally significant, however, is this fact: News about higher productivity comes just at a time when the United Steelworkers Union is winding up for collective bargaining in a few months with the steel industry. Steel has an important bellwether effect, of course. Anything that might lead to more pressure to share so-called "productivity gains" with labor could be very costly to the industry, to consumers, and to other industries influenced by steel wages.

Here's where the importance of perspective comes into the picture. Simply to say "Productivity has gone up, and therefore industry should pay workers more" is to be dangerously deluded.

The important point to remember here is that short-term rises or falls in productivity (especially as measured by broad national figures) are meaningless. What's important is the long-term *trend*. And what's even more important is what's behind the trend.

The fact is that the trend has been disappointing. Productivity has *not* shown substantial improvement over the long term. And, of course, by now there are very few people who are silly enough to think that productivity, even though often expressed in terms of "output per man-hour," is achieved by extra worker effort. This simply isn't the case.

The real source of growth in productivity is capital investment in newer and better machines, equipment, and facilities. That investment must be paid for out of increased output. The real enemies of productivity are those who, through excessive taxation and unsound depreciation policies, inhibit the building of new productive facilities or the modernization of old.

Why are we stirred up about all this? Because we are fearful that the steel industry and many other industries that follow the so-called "steel bargaining pattern" will be saddled with an unjustified and dangerous financial burden next year in the form of high wage increases based on increased output per man-hour.

The argument that these are justified by figures showing a national increase in productivity simply doesn't hold water. We are told on reliable authority that it is traditional and almost inevitable that there will be a short-term rise in productivity statistics whenever the economy starts to pull up out of a recession. By this time, the majority of companies have managed to strip out the dead wood (personal and mechanical) from their operations. They are just about running smoothly on a minimum basis. They are using their most efficient equipment. They don't start hiring back or making additions to personnel until they are positive that a solid pattern of upturn is definitely and firmly established.

It follows that during the early stages of upturn, with longer-run orders coming in and the labor force stripped down to experienced employees, many plants then press to increase their production without increasing the number of employees in proportion. Moreover, a more efficient utilization of certain employees (maintenance, for example) is possible. The result is that there's a remarkable short-term increase in output per man-hour.

But, here again, perspective is vitally important. What happens next is that there's a sharp *drop* in the rate of increase in output per man-hour as additional, less experienced people are brought back into the organization and fitted back into the operation, and less efficient equipment is put back into service.

So, let's not kid ourselves or let ourselves be kidded by others. We see nothing, at this stage of the game, that justifies a drive by organized labor for more productivity increases. If any industry, particularly the steel industry, gives in to such demands next year, we think that a serious mistake will have been made. Don't forget that over-all labor costs have been rising much faster than output, and cost-push inflation has resulted.

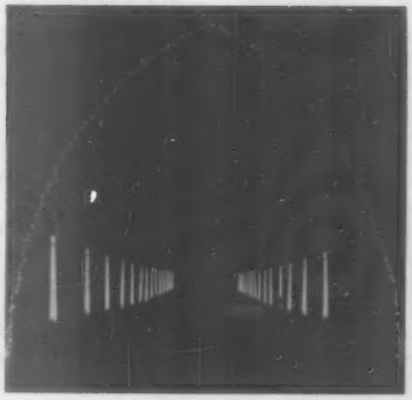
As a matter of fact, we think that organized labor has a fine opportunity here to show its maturity by recognizing the essentially short-term character of the present productivity trend figures and by refraining from trying to take advantage of a situation that's not going to last. No good can come of opportunism in this case. We suggest that Mr. David J. McDonald, president of the Steelworkers, knows this. We hope he is a big enough man to act on it.

Spruce Up All Over Your Plant Grounds

Or use little pines. Trees in the photo aren't really growing—they're cut, supported by guy wires. Santa display (sheetmetal with aluminum tubing) was made in plant shop. Company artists did the painting. *(Olson Rug Company, Chicago)*

Dramatize Your Entrance Driveways

The 20-ft. arch is ½-in. waterpipe; candles are simple wood frame with 8-ft. fluorescent. Silver decorations and lamps are wire-tied. Outside shell is translucent plastic. *(General Electric Lamp Division, Cleveland)*



Light Up Your Flagpole for a Festive Look ▸

Maybe your budget won't stand the 5500 lamps in this giant at G-E's Lamp Division (Cleveland). But the idea is there if you have a tower, flagpole, or any high structure to drape lamps on.

Seek the Most Cheer From Your Plant Exterior

The big, square plant below (Chase Brass & Copper Company) was hard to decorate. But this display gave it a touch of Christmas warmth. Everything used is commercially available except the 15-ft. stars. They're simple wood frames mounted with exposed sign lamps.

For the look of Christmas and . . .

That Festive Yuletide Feeling . . .

. . . here are guides on what to do—and what to avoid. These simple problem-solvers will help you make the most of a wonderful season of the year.

CHRISTMAS problems got you down? Cheer up. They needn't spoil your Yuletide joy. Fact is, you'll brighten visibly when you see the ideas for decorating your plant (facing page) and for solving three of your troublesome Christmas problems (text below).

1. THE GIFT PROBLEM

Ever since the Wise Men brought gold, frankincense, and myrrh, there's been no standard in giving. But here are five guides that steer other plants on the gift problem and may help you:

• Personal selection of gifts for employees' kids is the practice at Rolled Steel Corporation (Skokie, Ill.). Children are surveyed as to age, sex, interests. When Santa slides down the chimney at the Christmas party, Johnny Jones's gift has Johnny's name on it, is tailored just for him.

• Employee choice makes gifts just right for employees of Kroehler Manufacturing Company (Naperville, Ill.). Kroehler gets into action early, displays about 50 gift items in the plant cafeteria in October. Employees are asked to bring their families to an open house to select the gift they would like to have.

• Employee exchanges of gifts are usually permitted, fall under the "hands-off" rule. Why? Because it's hard to make a case that such exchanges cause any disturbance to plant routine.

• Supplier gifts to employees are usually taboo. Such gifts nearly always create jealousies—and lead some suppliers to expect favors. But this problem can be a tough one to control, especially if friendships are involved.

• Special gifts go to special citizens at Basic Refractories, Inc. (Fremont, Ohio). In 1953 the company began a plan of giving 25 shares of company stock to its 25-year employees. A few years ago a 50-year employee saw the company Santa, walked off with 100 shares.

By GEORGE A. HOY
Industrial Management Editor
FACTORY

2. HOLIDAY TIME OFF

If you want to be in the same sleigh with most employers, you'll have to set a double standard for time off. Most employers let salaried people take reasonable time off—to shop for personal Christmas needs. But it's different in the plant. There, paid time off is rare—but not unheard of. Some companies let employees take personal time off during the holiday season—but without pay. They encourage employees to save vacation time for this purpose.

3. THE CHRISTMAS PARTY

A Christmas party can help prove the boss is a likable human being. Or it can spell disaster. If there's one element that sets the stage for trouble, it's alcohol.

So alcohol is the culprit in the party program. Think that makes your problem simple? Depends on your plant and your employees' attitudes. Some employees welcome a dry party. Others won't come—or come because they feel they must, determined not to have a good time.

If you decide to have a dry party, your chances of having a roaring success are in direct proportion to (1) degree of family participation, (2) effectiveness of your entertainment plans. Scott Paper Company (Chester, Pa.) has a solution: One section of the plant is cleared out, cleaned up. Then a real "Christmas Carnival" is held, with amusement rides (even live ponies) for the kids. Decorations, Santa, and gifts set the Christmas theme.

If you decide you must have alcohol to meet employee demands, tradition, or your own feeling of what's best, follow these four rules:

• Make sure wives and husbands are invited, preferably by letter. Sweethearts are best omitted. The lovesick apprentice can always leave after he puts in an appearance.

• Serve the food early. A full stomach helps keep drinkers upright.

• Plan emergency entertainment. If the going gets rough, you can always shut the bar for an hour.

• Start and finish early. If the party is arranged to break up early, your chances of grief are substantially reduced. Hold some sort of finale after the bar closes. One suggestion: door-prize drawings. Idea is to give employees a chance to sober up before they start home.

In spite of everything, though, the manager is a prime target for the party drunk. You may be told off, insulted in other ways. So tighten your mental belt in advance. One paper company boss didn't, got mad when the beer hit him in the eye. Gave the culprit a month-long layoff. But an arbitrator ruled against the company, said it had no business disciplining a man off the job. Especially after supplying the liquor.

Now ready—FACTORY's 1958 Index. For free copy, write FACTORY Reader Service.

Better Make-or-Buy Decisions

There's too much at stake these days to risk hit-or-miss figuring. Here's how to smarten up your decisions. Your company will gain—and you can be a hero.

DO YOU MAKE or do you buy? Pesky as the problem may be, you've got to come to grips with it sooner or later. That's why this plan for making the right decision will help you (see worksheet, facing page).

Good make-buy analysis can make you the man who spotted non-competitive shop practices, found who was the inefficient vendor, pinpointed needed changes in plant and equipment, or boosted the profitability of your department—and company.

Many plant men never lose their air of confusion on make-buy decisions. They remain permanently puzzled. So they try progressive cost reduction—so much per year—and hope for the best.

But those who know how to make good make-buy analyses come up with clear conclusions that tell top management it isn't groping along on vague assumptions—isn't burning down the barn to roast the pig.

The plan described here tells how you can come up with the profitable answers. And it gives you four typical problems to point up the major questions you must answer to arrive at a realistic analysis.

But first, what is the base for this approach to make-buy problems?

The operating objective—The prime aim of a company is maximum short- and long-range return on the assets under its control—cash, tools, facilities, inventory, product designs. The plant man helps reach this objective by:

. . . *Cutting unit material and processing costs.*

. . . *Minimizing cash investment needed to make end products.* This requires close attention to inventory control, best use of equipment and facilities.

. . . *Giving priority to products having the greatest profit yield*—improving product mix.

In addition, the company must meet commitments in production schedules and quality standards to maintain and expand profitable operation.

Make-buy decisions can affect all of these objectives. Therefore, it doesn't make sense to base your decision on comparison of unit costs alone, ignoring the other factors. Good cost procedures are important. But most important is the fundamental concept of making these decisions on the basis of how they affect return on investment.

Comparing unit costs alone can lead to trouble. For example: Unit-cost comparison involves the elementary blunder of ignoring the impact of an investment in machines or rearrangement, which would dwarf the savings. Many companies, of course, are generally alert to the need for a return on any investment in facilities. But others still are not.

A far more likely pitfall: Comparing only unit costs, the analyst may ignore the impact of a make-buy decision on working capital. Often a decision to make at a lower unit cost takes more working capital, causes a sub-par return on investment.

Comparing only unit costs leads to costly haste in reaching make-buy decisions on individual parts. But the return-on-investment criterion reveals the need to balance the make-buy possibilities in many parts.

LAYING THE GROUNDWORK

Measure costs—In analyzing make-buy alternatives, you must accurately measure the effect of your plant on costs, sales volume, and investment. This requires close attention to cash or out-of-pocket outlays (for production costs, tooling and machine investment) and to cash recovery of investment outlays. You'll also need accurate knowledge of product costs. Shop costs for labor, material, and variable overhead on specific products and processes must also be pinpointed. Broad allocations will lead to seriously wrong decisions. Truly fixed expenses must be carefully set aside for quite a different type of handling.

Review the facts—Further, constant analysis of many parts and operations is essential for your company to reach the most profitable make-buy position. A decision on a single part, favorable in itself, often ties up facilities that can be used for prompt supply of more profitable parts. Or many parts now being bought might be made much more cheaply using equipment and space made available by vending out other parts at slightly higher unit costs. A balanced make-buy analysis program pays regular attention to these broader possibilities.

Weigh the options—You must choose wisely between several possible make-buy decisions that together are beyond the company's immediate financial capacity. Three roughly equal investments may yield 60%, 80%,

By E. B. COCHRAN, Staff Assistant to the Controller
Rohr Aircraft Corporation, Chula Vista, Calif.
(This article was written when Mr. Cochran was with Curtiss-Wright Corporation.)

WORKSHEET FOR MAKE-BUY DECISION

Name _____ Part No. _____

Used On _____

Major Components _____ Similar Items Not Included _____

UNIT VOLUME	Total Units	Actual			Forecasted			
Quarters ☐								
Years ☐								

Description	MAKE	BUY
PROCESSES & FACILITIES		

UNIT COST ANALYSIS

	By Forecasted Period					By Forecasted Period			
Direct Labor									
off Std. %	$	$	$	$	Material	$	$	$	$
Var. O'head % of DL					Escalation				
Raw Material					Mat'l Burden % to Mat'l				
Semi Fin.					Tools (cash outlay)				
Mat'l O'head					Other				
Total	$	$	$	$	TOTAL	$	$	$	$
Cash Asset Costs	$	$	$	$					

INVESTMENT DATA (cash outlay)

	Selected Dates				Average Value	Recovery Value	Selected Dates			Average Value	Recovery Value
Cash	$	$	$	$	$	X	$	$	$	$	X
Receivable											
Inventory:											
Raw											
In Process											
Finished											
Facilities											
Tools											
Less:											
Payables						X					X
Accru. Payroll						X					X
Net	$	$	$	$	$		$	$	$	$	

RETURN ON INVESTMENT

	Make	Buy	Differ.
Unit Costs	$		
Asset Costs			
Other Profits			
Total			
Average Investment			

Rate of Return

Average Profit & Investment ____%

Discounted Cash Flow ____%

COMMENTS:

APPROVAL TO: MAKE ☐ BUY ☐

Signature							
Dept.	Prod. Control	Process. Engrg.	Indus. Engrg.	Purch.	Cost Analysis	Dir. Mfg.	Controller
Date							

and 100% return per year. But the last—and apparently most desirable—may have a total life of only one year, the second may have a life of five years. If further investments that will re-employ (at 80% or better) the cash paid back by the 100% project are not available, it may be better in the long run to choose the 80% project.

Figure payoff timing—Lastly, you must beware of projects for which the payback does not begin for some time, especially if it then comes with a rush. An example is the construction of extra facilities to avoid extra costs of buying parts during the one year out of three when volume exceeds peak capacity. Such projects are a heavy load on company cash resources because they do not pay for themselves currently. Worse, they are more exposed to unanticipated events (such as a recession) that may cancel most of the benefits after the costs have been incurred.

Below are the basic considerations you'll want to weigh before you arrive at a decision.

How to Solve Four Make-or-Buy Problems

1. USING PRESENT TOOLS AND FACILITIES

As a basis for discussion, let's review a typical make-buy analysis. Assume a company uses a machined part for which ample tooling, facilities, and manpower are immediately available.

Ordinary cost analysis shows that for quantities of 1000 pieces per month the best vendor could supply the part for $26 per unit, against your total production cost of $30. This indicates savings, from buying the part, of $4 per unit times 12,000 units per year—a total of $48,000 per year.

But take a closer look at unit costs:

	Shop cost	Vendor cost
Material (net)	$ 2.10	$23.75
Freight	—	1.00
Direct labor		
Standard	5.00	—
Variance	3.29 (Plating problem and low performance)	—
Overhead		
Fixed	5.00	—
Variable	12.18	1.25 (Order handling, receiving, inspection, storage)
Tooling	2.43	—
	$30.00	$26.00

Of the shop's total cost of $30 per unit, $7.43 is in fixed items—fixed overhead plus tooling already in the shop. This $7.43 is a pure allocation of costs for equipment, manufacturing management, tools, and other items for which no additional expense will be incurred by making this particular part in your plant as opposed to buying it.

If the company omits these allocations, the net result is an out-of-pocket shop cost of $22.57 per unit against the vendor cost of $26. By continuing to make the part you would save $3.43 per unit times 12,000 pieces per year, for total savings of $41,000 per year. The practical situation is exactly reversed from that shown by ordinary cost analysis.

Up to this point we have considered only the first of the three criteria listed earlier: unit costs, cash investment, and product mix. The third factor will be discussed later, but look now at the second—minimizing cash investment. Because our example excludes the need for additional facilities or tooling, the principal investment item will be inventory. The investment required is determined as follows:

Requirements	To obtain part Through shop	Through vendor	Basis for figuring investment
Cash	$ 830	$ 5,000	20% of accounts payable, accrued payrolls
Inventory			
In receiving	1,050	12,380	15 days
In process	24,660	—	60 days
Finished stores	11,280	13,000	15 days
Facilities	—	—	—
Tooling	—	—	—
	$37,820	$30,380	
Sources (deduct)			
Accounts payable to vendor	2,100	24,750	30 days' material
Accrued payrolls	2,070	500	1 week's labor
Net company investment	$33,650	$ 5,130	
Per thousand units	$ 2,800	$ 430	

The net investment tied up to make the part will be about $28,500 more than if it is bought. This additional investment by the company will produce a profit of $41,000 a year, return of 144%. The decision to make would be a profitable one.

However, if the item were one with cost savings of only $15,000 per year, the yield would be cut to 52%. While this may sound good, it represents only average performance for a profitable operation. It may be too low relative to opportunities on other parts.

Note that working capital items make up a large proportion of the investment required. Here it is 100%. No other machine tools or space will be needed.

2. ADDING NEW FACILITIES

The basic problem (above) changes just a little if new facilities are involved in a make-buy decision.

First, you should incorporate any new facilities in the investment data. The value used should be an average of installed cost and the cash value of the facility at the end of the period for which it is to be used on the project. The latter is important. A special-purpose tool may be worthless after only six months of use for any other application. New general-purpose equipment may

bring a new price of only half its installed cost after one or two years' use.

Taking our basic example, suppose new equipment, tools, and space had been required at an initial total cost-in-place of $100,000. After two years—the anticipated market life of the end product for which the part is to be produced—these facilities have an estimated net recovery value of $25,000. The revised investment picture will be:

	Investment to procure part	
	Shop	Vendor
Net working capital (as before)	$33,650	$5,130
Facilities		
Purchase value $100,000		
Recovery value $ 25,000		
Average value	62,500	—
Total Investment	$96,150	$5,130

The net investment required to make the part will average $91,000 more than to buy it ($62,500 more than when no new equipment was involved.) Working capital items are still over one-third of the total investment.

Next, operating costs should be adjusted for loss in value of new facilities. Because original value drops by $75,000 ($100,000 to $25,000) in two years, operating costs will look like this:

	Shop	Vendor
Total variable cost per unit (as before)	$ 22.57	$ 26.00
For two years, 24,000 units	541,700	624,000
Net cost of facilities	75,000	—
Total cash cost	$616,700	$624,000

Savings from manufacture of the part are $3650 per year. Return on the average net investment (now up to $91,000) is only 4% before taxes. This is far below the level needed to justify the outlay. We should continue to buy the part under these conditions.

3. INCREASING SALES VOLUME

Turn now to the question of getting the most out of your product mix. Under conditions of short supply—a "seller's market"—the company may find it cannot meet the demand for specific items. This may result in turning down new orders, missed schedules, or customers finding other sources of supply. There is a loss in potential sales volume. A make-buy decision that will increase capacity to produce parts in short supply must consider the contribution to company revenues from the increased volume. Let's add this to our basic example.

Assume that the estimated increase is 18,000 units over two years, or 9000 per year. The addition to net working capital would be $25,240 (9000 units x $2800 per 1000 units from Problem 1). Investment in additional facilities would be $62,500 (Problem 2). Total added investment for 18,000 units: $87,740.

Costs and profits for the two years would be:

Additional sales (18,000 units at $40)		$720,000
Less cash costs:		
18,000 units at $22.57	$406,260	
Net cost of facilities	75,000	481,260
Contribution to profit		$238,740

How to Look at Fixed Costs

Fixed costs are usually of two sorts: non-cash costs such as depreciation charges and the allocated share of general organization expense; and cash costs such as rentals, utilities, taxes, or salary cost of specialized supervision required.

On occasion, certain cash fixed costs may be eliminated if a product is bought outside. In such a case this portion of fixed costs should be considered in comparing shop with vendor costs.

For longer-run decisions, even non-cash costs may enter the make-buy calculation. You may no longer need a piece of general-purpose equipment when you purchase an item from outside. In this event the resale value (at market price, not book value) constitutes additional funds from the change from make to buy. These funds should be reflected in the analysis as a reduction in capital investment.

The additional profit averages $119,400 per year for a return of 136% on the investment of $87,740.

But suppose it has been impractical to increase shop output in time, and suppose the only acceptable vendor wants $26 per unit plus a cash tooling charge of $75,000. This requires an average investment of $37,500 over the 2-year period. Also an addition to working capital of $4000 is required (9000 units x $430 per 1000 units from Problem 1). Total investment is $41,500.

Here's the 2-year sales and profit picture:

Additional sales (18,000 at $40)		$720,000
Less: Vendor tooling charge	$ 75,000	
Material (18,000 units at $26)	468,000	543,000
Net contribution to profit		$187,000

The additional profit is $93,500 per year. This yields over 225% return on the investment of $41,500. This is not unusual: Unit costs rise and plant utilization falls, but the company comes out ahead.

Suppose further that both alternatives were open—manufacturing at a 136% return on an investment of $87,700, or buying at a 225% return on an investment of $41,500. What then? Obviously you must weigh the higher return from buying against the greater dollar profit (and very good return) from making.

This requires a comparison with other investment alternatives and may even call for top corporate consideration. The principle is simple: to get the greatest return from the funds available to invest. Buying the part would require $46,200 less investment. That amount would be available to invest in another way. You need only use these funds at something a little better than a breakeven return to beat the return on making the part.

The breakeven return (Y) is easily calculated:

$$(\$41{,}500 \times 225\%) + (\$46{,}200 \times Y) = \$87{,}700 \times 136\%$$

$$Y = 56\%$$

If you decide to buy the additional units, you must find a return of 56% or more for the $46,200 released by that decision. Otherwise you're better off to make the part at a return of 136% on the entire $87,700.

Turn the page

How a Multi-Product Line Will Affect Make-Buy Decisions

CASE 1	TOTAL	PRODUCT A	B	C	D	E
Sales						
Units (add 000)	440	100	50	200	10	80
Price per unit	$ 34.70	$ 10	$ 80	$ 40	$ 65	$ 20
Volume (add 000)	$15,250	$1,000	$4,000	$8,000	$ 650	$1,600
Variable Costs (add 000)						
Direct labor	$ 3,000	$ 100	$ 600	$2,000	$ 20	$ 280
Total	$10,820	$ 700	$2,500	$6,000	$ 420	$1,200
Profit on variable cost						
Amount (add 000)	$ 4,430	$ 300	$1,500	$2,000	$ 230	$ 400
% of sales	29%	30%	38%	25%	35%	25%
Fixed costs (add 000)	$ 3,000	x	x	x	x	x
Net operating profit (add 000)	$ 1,530	x	x	x	x	x

CASE 2	TOTAL	PRODUCT A	B	C	D	E
Sales (add 000)						
Units	608	200	50	240	10	108
Volume	$18,410	$2,000	$4,000	$9,600	$ 650	$2,160
Variable costs (add 000)						
Direct labor	$ 3,000	$ 200	$ 0	$2,400	$ 20	$ 380
Total	$13,640	$1,400	$3,000	$7,200	$ 420	$1,620
Profit on variable cost (add 000)	$ 4,770	$ 600	$1,000	$2,400	$ 230	$ 540

CASE 3	TOTAL	PRODUCT A	B	C	D	E
Sales (add 000)						
Units	549	160	60	218	20	91
Volume	$18,240	$1,600	$4,800	$8,720	$1,300	$1,820
Variable costs (add 000)						
Direct labor	$ 3,000	$ 160	$ 300	$2,180	$ 40	$ 320
Total	$13,165	$1,120	$3,300	$6,540	$ 840	$1,365
Profit on variable costs (add 000)	$ 5,075	$ 480	$1,500	$2,180	$ 460	$ 455

Begins on page 40

4. REDISTRIBUTING PRODUCTION EFFORT

Often an operation runs up against a production roadblock from lack of enough floor space, machines, skilled manpower, special tools, particular materials, or other need. It's argued that there's no use deciding to make a part (on which cash costs are below vendor costs) if you don't have the capacity to do it.

Under these conditions many companies use "full costs" (including overhead) to guide make-buy decisions. But maximizing cash inflow with the least permanent cash investment and cash costs is still the company's basic objective. Even so, you can't reach make-buy decisions on a part-by-part basis. Your problem thus shifts to another plane.

When sales volume is limited by a major element of production you must do two things:

. . . *Determine the effect* of a make-or-buy shift on

your profit and investment changes for all products in that particular line.

. . . *Ensure that your rearrangement* is the best choice, because it's possible there may be several of equal or greater benefit available.

Your decisions must be on whole groups of parts, or in patterns of make-buy relationships. You must buy some items at a calculated premium, freeing equipment, space, tooling, or manpower with which to make other parts at a large saving and substantial return on any new investment required.

The subtleties involved here are limited only by the perception and ingenuity of those who are responsible for proposals and decisions. Another limiting factor may be capacity to calculate alternatives. You may need electronic equipment—even computer service—if the problem is complex.

As a simple problem, take a case involving five products. The peak output is 440,000 units per year, yielding a sales volume of $15.3-million and a profit of $1.5-million per year at present costs. You can sell substantially more product. But direct labor costs of $3-million represent maximum use of labor because of layout and equipment limitations. The table on the facing page shows (Case 1) pertinent sales and cost data relative to this particular problem.

This is a case where it is unnecessary to allocate fixed costs when a profit statement is prepared. (For explanation, see the box on page 43). As you consider alternatives you need only watch the effects of variable cost on the profit, plus the ratio of these changes to investment dollars needed or saved. The same increases or decreases will occur in net profit because a flat subtraction of $3-million is the only difference involved.

Now assume (Case 2) you can find a vendor to make Product B at an increase in variable cost of $10 per unit, or 20%. It's unlikely that reduced investment would justify a decision to buy Product B. But consider the impact on profit when you add production and sales of the other products made possible by eliminating B from the plant as shown in Case 2.

You use the labor formerly expended on Product B to double the volume of Product A and increase Products C and E significantly. You increase sales by $3-million, profit by $340,000. With $300,000 required in additional working capital, the return is 113% ($340,000/$300,000 x 100%).

Now consider another means (Case 3 of redistributing the plant's effort. This involves using half the plant's normal capacity for Product B, yielding 25,000 units, supplementing it by buying an additional 35,000 units, and using the freed labor to increase output of other products.

Although sales are slightly below the level achieved in the first trial, profit is up another $305,000 for a total increase of $645,000. Investment required is $425,000 (instead of $300,000) over the original situation. Return is 152% (645,000/$425,000 x 100%), much better than the first alternative.

Technical refinements—To demonstrate the practical contributions of this approach to make-buy decisions, we have purposely over-simplified one aspect of considerable importance. The calculation of your return on investment should reflect two things: annual compounding effects of profits or investments and tax recoveries due to depreciation write-offs or other special circumstances.

The first can have a substantial effect where cash investment is concentrated in an early year and the return comes in later ones. Equal influence can be exerted when the decline in market value of an asset is not fully allowed for tax purposes or when accelerated depreciation is permitted. Early recovery of investment through savings or tax write-offs compounds the benefits. Rate of depreciation recovery can sharply increase or reduce the final return beyond that shown by the normal arithmetical averaging technique.

Only the discounted cash flow method is truly accurate, and it need not be too complex if properly organized. (For appropriate details see such discussions as that by Joel Dean on "Measuring the Productivity of Capital," *Harvard Business Review*, Jan.-Feb. 1954. For "how-to" information see "Newest Way to Figure Payoff," by Ray Reul, FACTORY, October 1955, page 92.)

ORGANIZING FOR MAKE-BUY DECISIONS

The question of organization responsibility often comes up. Because make-buy decisions are usually interdepartmental, the following general practices will be helpful:

The controller must provide accurate cost data on manufacturing operations. This, however, requires estimates from processing, industrial engineering, and purchasing, as well as good accounting techniques and proper evaluation of schedules and capacity requirements by production control. Determination of capital requirements is the final responsibility of the controller. But it is desirable for industrial engineering to have a simple form spelling out the essential steps in developing a make-buy recommendation. With this form industrial engineering can make an approximate calculation of return on investment before taxes. This is useful in deciding whether it's worthwhile to go through the entire procedure. The controller should prepare the final calculation, including a cash flow analysis.

Often an interdepartmental committee administers the make-buy procedure. This is a good technique to obtain contributions from operating and financial personnel. With top-level members from the departments mentioned, decisions should be defined clearly enough for a simple majority vote to settle most issues. Obviously major decisions should be subject to final approval by top management. The sample form shown on page 41 can be used to summarize data to make decisions. A follow-up audit is essential to check on the accuracy of decisions and the reliability of the data.

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5 Smart Ideas Save $200,000

Here's a plant that works on a smart theory: If you develop good managers, the cost-cutting ideas will take care of themselves.

TO CUT COSTS, develop management. That's the formula for successful operation and successful methods improvements of the Military Products Division of International Business Machine Corporation (Kingston, N. Y.). On these and the next two pages you'll find plenty of evidence that the IBM approach—called Manufacturing Improvement (MI)—is effective.

As part of IBM's management development and training program, several men went to New York University's "Work Simplification Round Table." One of the division men who took the course was Manufacturing Engineer Bruce Stout. Stout sold the work simplification approach to methods improvement to a committee of key managers in the division. That committee gave methods improvement the impetus it needed.

For the first six months Stout handled the methods-improvement campaign on a part-time basis. He trained other management people in a 10-session, 20-hour course.

The objective of the program is simple: Cost reduction. Emphasis is on work simplification know-how and the application of its techniques. If the originator of an idea can develop and install his idea without help, he goes to it. There's no red tape, no incentive rate to correct. Results show up in performance.

If the originator needs help, he prepares and submits a manufacturing improvement request (MIR) to the MI coordinator. The coordinator sends the request to the appropriate project manager, who then assigns the investigation job to the staff department that can help most. It might be tooling, test equipment engineering, methods, materials handling, or another department.

Kingston's system has so impressed IBM high command that it has decided to establish similar functions at all IBM manufacturing plants. As a result, a Work Simplification seminar was held at Kingston to instruct representatives from each IBM plant in the workings of the system. Professors W. R. Mullee and David Porter of N. Y. U. presented the week-long program.

How effective is Kingston's program? It's highly effective. One of every two ideas works. Typical saving per idea: about $500. Total saving on the best five ideas submitted to date: nearly $200,000.

Soldering Quicker by 98%

Problem—Assembly of a basic memory unit for a computer requires 280 soldered connections.

Old way—Individual soldering of connections by hand. Took 30 minutes.

New way—First improvement was a semi-automatic set-up whereby one complete side of 70 connections was dip-soldered. This cut the time to 3 minutes per frame. But then came an improvement on an improvement. The method now in use solders all the connections in one operation. Each unit is placed in a soldering pot so all terminals are submerged and connections are soldered at one time. This is done by capillary action of the solder and terminals. New method completes the operation in 9 seconds.

Benefits—Operation time cut from 30 minutes to 9 seconds—a 98% improvement. Also, better quality, less eyestrain.

Sinking Well Solves Assembly Problem

Problem—To complete the assembly of a complex electronic unit, tubes and a handle have to be added. Then a fiberboard sleeve has to be placed over the unit to protect the wiring and soldered connections. Placing the sleeve is an awkward stand-up operation.

New way—A well is built into the bench. The fiberboard sleeve goes in the well. Then the assembly is placed in the sleeve. Tubes are inserted, the handle is attached, and the completed unit, including sleeve, is removed from workbench ready for inspection.

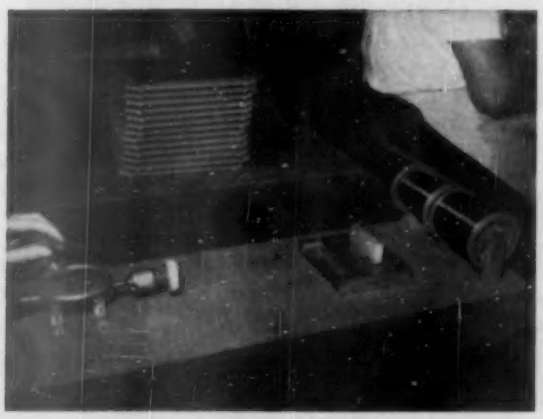
Benefits—The new method boosts production, makes the job easier for the operator.

Plastic Bags Ban Scratches

Problem—After metal assembly covers have been painted, they are stored for assembly. During this handling, finger-marks and minor scratches necessitated touch-up rework when taken from storage, and before the covers could be used.

New way—Polyethylene bags are placed over each cover immediately after they're painted and dried. Then the covers are placed in special handling racks for movement and storage.

Benefits—The new method eliminates smudges and scratches from handling. Also the covers serve a psychological purpose—operators tend to handle them more carefully.



Turn the Wheel—Job's Done

Problem—Special production job calls for two 9-in. lengths of wire twisted together. The wire is used as a jumper on an assembly.

Old way—Two spools of wire were placed on a workbench. Operator manually twisted the wires together (10 twists per inch).

New way—Two spools are mounted on a fixture. Wires feed through a block to a hand drill mounted on fixture. With a few turns of the hand drill operator produces the 90 turns required in the twisted wires.

Benefits—The operation now takes less than one-fourth the time, is easier for the operator.

Turn the page

Begins on page 46

New Tube Draws off Smoke, Fumes

Problem—Solder and flux used in quantity in a small bench assembly area creates smoke and fumes around an operator's face and head.

Old way—Normal air exchange and circulation was the only means of dispersing soldering fumes.

New way—A small copper tube is attached to each soldering iron. A small jet of air exhausts through the copper tube while the iron is used.

Benefits—A pesky problem of working conditions is solved. Obviously, it helps production although comparative output data are not available. The important benefit is improvement in job conditions.

Cable Cartons Boost Efficiency

Problem—Electronics manufacturing uses a lot of cable—and many varieties. Storing and handling is a big problem.

Old way—Cables hung on portable racks. Terminals and connectors were exposed to damage.

New way—Standard steel storage shelves and common fiberboard cartons turn the trick. Cables are placed in the cartons. Each carton is clearly marked and goes to the storage shelves.

Benefits—The new method saves space because it takes advantage of height in storage. It saves time in locating and placing cables. Inventory control is more efficient. Parts are protected from handling damage.

Two Hands Twice as Good

Problem—Several terminals have to be attached to plates in a subassembly operation. Terminals are secured in position by a nut under the plate.

Old way—One hand held the nut underneath and the other turned the terminal into it.

New way—Improved method saves steps by allowing the use of both hands simultaneously. A fixture allows room for four plates to be placed side by side. Slots are milled in the fixture to accommodate all terminals, act as a lower wrench to hold nuts. Terminals are placed on plates and tightened with air torque guns. When complete, the four plates are ejected by a hand lever (under operator's right wrist in photo).

Benefits—Using both hands, operator has increased production efficiency over 100%.

Book and Fixture Save 30%

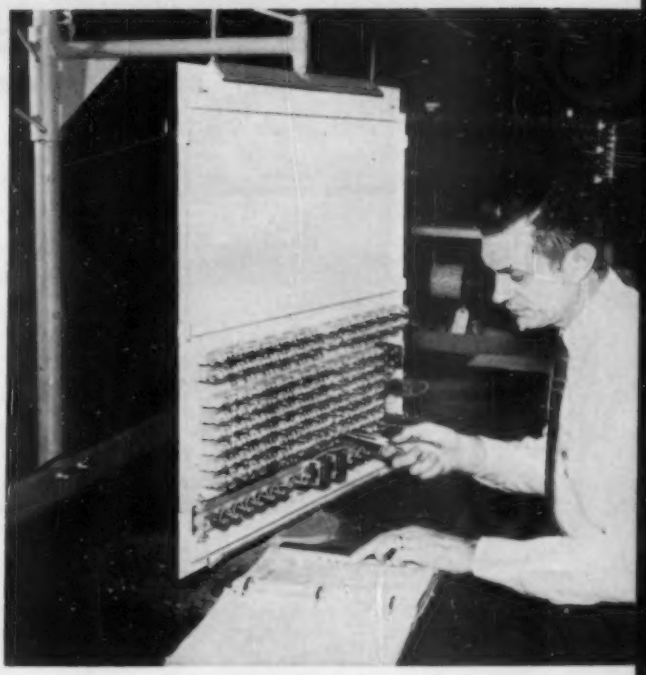
Problem—Assembly and wiring of control panels requires placement of many components and wires.

Old way—Operators had to do the job at standard work benches. They needed mechanical prints, wiring charts, and cable prints for reference. It was hard to read reference drawings. Production losses mounted, eyestrain and fatigue were excessive.

New way—An adjustable holding fixture and condensed assembly instructions now do the job. Fixture holds panels upright, permits a full 360-deg. rotation. Locking handle on top fixes panel in any work position. Fixture height is adjustable, providing flexibility in handling a variety of panel sizes.

The condensed assembly instructions, in book form, visually portray termination points for all wiring and a parts listing. Also step-by-step operating procedures are included. Wiring sequence now allows ease and accessibility to all termination points.

Benefits—These two improvements have resulted in a saving of over 30% in direct labor, less operator fatigue, less handling time, less damage, elimination of interpretation of blueprints and charts.



Better Lights Pay Off

Problem—During the last operation in the manufacture of a complex electronic assembly, over 200 soldered joints are inspected. Takes close inspection, fine eyework.

Old way—Old method used a regular workbench with two bench lights. With these bench lights within 4 inches of the unit it was possible to attain a light level of 400 foot-candles on the surface of the unit. But this caused excessive glare from the plated surfaces of the unit.

New way—By means of plywood booths with eight 8-ft. fluorescent fixtures overhead, IBM can provide 400 foot-candles of diffused light on the surface of the unit. Heat is dissipated by cutting slots in the ceiling of the booth.

Benefits—New method reduces eyestrain by providing a constant light level. It cuts inspection time by eliminating the need for constant adjustments of bench lights. And total savings are five times the cost of installation.

Burning and Buffing Cut Rejects

Problem—During the assembly of a highly delicate unit, Form Var insulation around a special wire has to be stripped to within $\frac{1}{32}$ inch of the terminals.

Old way—Worker used to strip the insulation from the wire with a pocketknife.

New way—Now the wire is placed over the tip of an Oryx soldering iron that chars the insulation. Then the charred insulation is removed by buffing.

Benefits—The new method increases production. It cuts rejects due to a slip of the knife. Also the new method is less fatiguing, safer.

CONSTRUCTION COST FACTS ON SIX NEW

	Plant 1	Plant 2	Plant 3	Plant 4	Plant 5	Plant 6
			Percent of Total Cost			
Plans and specifications	3.8%	3.6%	3.8%	4.3%	3.0%	5.4%
General conditions, temporary construction contractor's fee	7.1	5.0	9.4	9.3	6.5	11.3
Site work — Total	**7.5**	**6.2**	**5.9**	**10.0**	**5.4**	**3.2**
Grading and general excavation	3.2	3.6	3.2	4.6	2.2	1.9
Roads, sidewalks, parking areas	1.5	1.4	1.8	1.5	1.9	1.3
Railroad sidings	2.8	0.5	0.6	2.0	1.0	–
Landscaping	–	0.5	0.3	0.9	0.3	–
Highway bridge	–	–	–	0.3	–	–
Water wells	–	–	–	0.5	–	–
Fencing	–	0.2	–	0.4	–	–
Building — Total	**47.0**	**24.2**	**40.4**	**40.5**	**42.6**	**32.0**
Floors and foundations	11.8	8.7	9.7	10.1	9.5	8.1
Structural steel	17.4	26.0	12.9	16.2	20.5	9.7
Walls (masonry, sash, siding)	4.5	2.2	4.1	3.5	6.0	3.5
Roof deck and roofing	7.3	7.0	4.4	5.3	6.5	4.0
Miscellaneous iron	1.5	1.0	1.8	1.5	1.2	1.5
Masonry partitions	2.4	1.3	2.2	0.9	3.1	1.6
Doors	0.3	1.0	0.9	0.3	1.7	0.4
Acoustic ceilings (offices)	0.2	0.7	0.8	0.2	0.8	0.6
Special floors (office and toilets)	0.1	0.4	0.4	0.2	0.6	0.4
Movable office partitions	0.4	1.1	0.7	0.5	0.4	0.5
Plastering (offices)	–	0.2	0.1	–	0.1	0.1
Carpentry and millwork	0.2	0.2	0.7	0.9	1.0	0.5
Toilet partitions	–	0.1	0.1	0.1	0.2	0.1
Painting	0.9	1.3	1.6	0.8	1.0	1.0
Mechanical — Total	**7.5**	**16.6**	**19.0**	**15.0**	**17.5**	**25.2**
Plumbing	0.7	3.1	8.2	3.8	5.4	5.3
Heating, ventilating	2.9	6.6	6.7	7.7	7.4	5.6
Air conditioning (Note 1)	0.6	5.2	3.1	1.9	2.6	13.3
Sprinklers	3.3	1.7	1.0	1.6	2.1	1.0

How to Divvy Up New-Plant Money

Pinching pennies can cost as much (long run) as lavish spending. These detailed cost facts on six new plants will wise you up on allocating your dollars.

WANT a quick and easy way to spot danger signals in analyzing construction costs for your new plant? Then compare your estimated costs with percentages for the various elements in six recent Westinghouse plants (table above).

If your estimates are significantly higher for one or more elements, start asking, "Why?" Maybe there's some unusual reason. For example, poor subsoil conditions can lift your costs for excavation and foundations. Maybe a deliberate policy decision calls for plush offices. Nothing wrong with all that—if you do it with your eyes open.

If your estimates are significantly lower, that's also a signal to ask, "Why?" A low cost for steel may be okay for immediate operations. But will light framing prevent installing an overhead conveyor in the future? Skimping on construction can raise operating costs, require expensive future modifications. It's just as important to avoid spending too little as too much.

To help make your own cost analysis, Walter Wendelkin and Elmer Roeser of Westinghouse Headquarters Works Engineering have selected six plants that vary in size, location, type of activity (see lower part of table for descriptions). All are what Westinghouse describes

PLANTS–YARDSTICKS FOR YOUR OWN NEW PLANT

	Plant 1	Plant 2	Plant 3	Plant 4	Plant 5	Plant 6
			Percent of Total Cost			
Electrical (inside building) — Total	**9.3**	**13.2**	**13.0**	**14.0**	**11.0**	**15.7**
Power	–	–	–	–	5.2	–
Lighting	–	–	–	–	5.8	–
Outdoor services and utilities — Total	**17.8**	**4.2**	**8.5**	**6.9**	**4.0**	**7.2**
Outdoor lighting	0.3	0.1	2.0	0.4	0.1	0.6
Outdoor substation (Notes 2 and 3)	1.3	2.1	4.0	2.1	2.0	4.3
Sewer, water, gas lines	0.4	0.5	0.6	0.8	0.9	1.5
Fire protection and water tank	1.8	1.5	1.9	3.6	1.0	0.8
Service bridge	12.6	–	–	–	–	–
Extension of steam lines	1.4	–	–	–	–	–
Plant description						
Principal product or activity	Warehouse	Distribution Transformers	Transmission Capacitors	Electric Stairways	Repair Shop	Semi-Conductors
Number of employees	50	1200	450	200	100	400
Location	Midwest	Southeast	Midwest	Northeast	Northeast	East
Floor area, total (square feet)	522,640	637,812	292,163	259,580	71,263	160,010
Manufacturing	513,400	576,738	257,163	247,130	63,010	128,645
Office building (Note 4)	9,240	61,074	35,000	12,450	8,253	31,365
Bay size, manufacturing area (feet)	40x60	40x60	40x60	40x50	40x60	40x60
Clear height, general shop (feet)	20	25	20	20	18	16
Clear height, high bay (feet)	–	45	36	37	31	–
Maximum crane capacity (tons)	–	10	10	25	25	–
Main substation capacity (KVA) (Note 2)	–	7,500	5,000	2,500	500	4,000
Site area (acres) (Note 5)	50	238	148	160	5	119

Notes:

1. Office space is air conditioned in all plants. In Plant 6, 100% is air conditioned. Cost for offices 4.3% of total; for manufacturing area 8.0%.
2. Plant 1 has no substation, cost is for power line from Westinghouse plant on adjacent site.
3. Plant 5 substation owned by utility, not Westinghouse; cost is for extension from transmission line to plant.
4. Plant 4 offices are temporary, occupy space to be converted later to manufacturing.
5. Acquisition cost of site not included in figures.

as "reasonable cost" plants. No super-duper showcases. No corner-cutting to achieve absolute minimum cost. All are well designed, modern.

How can you compare? You may find one of these plants much like the one you're planning. Or you can combine elements (such as 100% air conditioning, Plant 6), then adjust figures to a new 100%. Since the figures are only general guides, combining isn't too dangerous.

Your estimating and accounting procedures may differ from Westinghouse's. If so, you'll have to make major adjustments to make these figures meaningful.

Costs out—The following are not considered part of plant cost, and are not included in the table:

. . . *Materials handling equipment,* such as trucks, conveyors, cranes.

. . . *Special machine foundations.*

. . . *Auxiliary electrical equipment* (low-voltage breakers, conduit, wiring drops, motor control centers, d-c and high-frequency equipment).

. . . *Air compressors.*

. . . *Piping drops and connections.*

. . . *Cafeteria, kitchen equipment.*

. . . *Site acquisition* (location surveys, options, legal fees, purchase price—in fact, all things involved in securing title to the site).

Costs in—The following are included as plant costs under the appropriate heading in the table:

. . . *Built-in provisions* for materials-handling equipment (truck ramps, dock levelators, crane rails and beams, heavier-than-normal trussing for overhead conveyors).

. . . *Piping loop for main process.*

. . . *Air conditioning compressors.*

. . . *Boilers for heating and hot water (process and domestic).*

. . . *Bus duct.*

If you're wondering about electrical equipment (all Westinghouse), figures in the table are adjusted to reflect normal sale price. In all cases (except Plant 1—a warehouse) distribution is a looped network. This has the highest initial cost of all distribution systems. But Westinghouse feels that reliability, continuity, and flexibility justify the higher cost. Plants with less exacting requirements might use a lower-cost system.

File Copy of this article available while supply lasts. Circle FC-20 on Reader Service Card next to back cover. For complete list of FC articles, see page 163.

What You Will Pay for What

THIS IS A REPORT on the cost of eight nearly new manufacturing plants. It's an exclusive FACTORY survey. It will give you clues (on these two pages and the next four) on the cost of the plant you're planning to build.

To grasp the real meaning of cost figures—any cost figures—for a new plant, you must look beyond the builder's price tag. Even such widely accepted measures as cost per square foot and cubic foot don't paint a true picture. What you really must know is what's included in the price—where the money goes, item by item. Then you can estimate what it would cost you to build a similar plant.

These eight plants are disguised. But the data are real. Here's what they show for each:

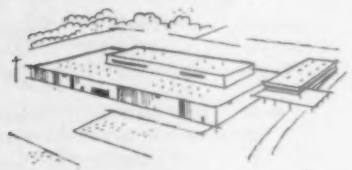
. . . *Description*—employment, floor space, cubage, foundation, framing, roof, bay size, power rating.

. . . *Construction costs*—total cost, cost per standard measuring unit, and cost for each major item.

. . . *Payoff*—how well the plant meets the goals for production and employee performance.

You just can't generalize from plant construction-

Comfort Cooling Everywhere



BASIC COST DATA

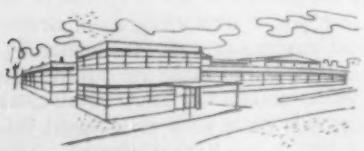
Total cost: $4,290,000.
Year completed: 1956.
Employees: office, 250; manufacturing 250; total, 500.
Office area: 80,000 sq. ft.
Manufacturing area: 270,000 sq. ft.
Total buildings area: 350,000 sq. ft.
Cost per square foot: $12.26.
Office cubage: 765,000 cu. ft.
Manufacturing cubage: 9,935,000 cu. ft.
Cost per cubic foot: $0.40.

Product quality in this 100% air-conditioned plant is 33% higher than at the former location. Yet air conditioning is primarily for comfort, not process.

The plant is located in the Southwest. It manufactures ventilating equipment and does mass-production machining, die casting, and assembly. Building frame is steel, with windowless walls of anodized aluminum. Roof has 2-in. spun-glass insulation beneath a built-up sheath. Process painting is done in a 50,000-sq.-ft. penthouse. Services are in separate buildings. The office is two-story. Floor loading is 600 psi.; power, 12,000 kva.; bays, 60x30 feet by 24 feet overhead. Value of products shipped in last 12 months was $6-million.

New plant payoff—Plant was built for a growing industry. Production is now double that of previous plant. Productivity is up 50%—credited mostly to extensive materials-handling equipment including three miles of conveyors. Employee attitude is excellent. Attendance and turnover differ little from an older plant in another part of the nation. But safety record is poorer—employees in the new location lack industrial experience.

Plenty of Air and Lots of Light



BASIC COST DATA

Total cost: $99,000
Year completed: 1955
Employees in the office, 20; in the manufacturing area, 100.
Total employees: 120
Office area: 2,100 sq. ft.
Manufacturing area: 30,000 sq. ft.
Total building area: 32,100 sq. ft.
Cost per square foot: $3.09.
Office cubage: 18,000 cu. ft.
Manufacturing cubage: 390,000 cu. ft.
Total cubage: 408,000 cu. ft.
Cost per cubic foot. $0.24.

Assembled window-wall units provide lots of light and air at low cost in this plant in the Southeast. It manufactures building materials. Processes are light, too—shearing, punching, riveting, welding, and bending. Construction is steel frame and poured-in-place gypsum roof on concrete pad floor.

Two-story air-conditioned office is separate from manufacturing area. Manufacturing-area bays are 24x24 feet with 13-ft. head clearance. No cafeteria. Main substation capacity is only 80 kva. Curtain walls at either end of plant provide for expansion. Value of products shipped in 1957 was $2-million.

New plant payoff—Like many another plant, this one was built simply because the old one was too small. And, mainly through relief of congestion and better layout, the new plant meets this objective—more room—very well. Production output is 15% higher than in the abandoned older plant. Employee productivity is up 5%. But even the original new space turned out to be inadequate. So it was enlarged by 14,000 square feet last year.

Employee reaction to the new building? They like it—and show it by better work attitudes. Attendance, safety, and turnover are at the same high level as in the old plant.

You Want in Your New Plant

cost yardsticks. There are too many variables to consider. For instance, in any one of these eight buildings you'll see that aside from size there are at least 10 factors affecting cost that differ.

The 10 variables are: (1) processes, (2) products, (3) geographical location, (4) plant site features, (5) design in terms of function and efficiency, (6) design in terms of architecture, (7) type and quality of construction, (8) labor and materials, (9) market conditions generally, and (10) the time of bidding and the value of the dollar during construction.

Figures you can use—These eight new-plant examples will help you estimate how much any of these 10 variables will affect the cost of the plant you plan to build. You'll see that bay size and overhead clearance, flexibility of layout for utilities, and the extent of air conditioning are strong cost factors. Cafeterias, fancy stone façades, and handsome landscaping also take their toll. Of course, it's up to your operating management group—and your financial managers—to decide what features you want in your new plant and how much you're willing to pay to get them.

DETAILED COST DATA

Land and improvements		
Land (130 acres)	$ 40,000	
Excavation, site clearance, grading, drainage	60,000	
Water supply, wells and lines	65,000	
Process and sanitary waste disposal, sewers	45,000	
Roads, drives, sidings, parking lots	100,000	
Landscaping, fences, enclosures	40,000	
Subtotal	**$ 350,000**	
Building shell	**$ 1,900,000**	
Plant service improvements		
Electrical, including power supply and distribution, lighting, communications	$ 387,000	
Heating and ventilating, including 100% air conditioning, dust and fume control	920,000	
Plumbing, including pumps, interior water and sewer lines, sprinklers, etc.	193,000	
Subtotal	**$ 1,500,000**	
Interior finishing: painting, plastering, floor covering and hardening		**$ 60,000**
Special facilities		
Cafeteria, including equipment		$ 15,000
Medical dispensary		15,000
Subtotal		**$ 30,000**
Furniture		
Office, not including office machines		$ 150,000
Shop, including chairs, tables, benches, racks, shelves, etc.		30,000
Subtotal		**$ 180,000**
Professional fees: architects, engineers, and consultants		**$ 270,000**
Grand Total Cost of New Plant Building		**$ 4,290,000**

DETAILED COST DATA

Land and improvements		
Land (5 acres)	$ 10,000	
Excavation, site clearance, grading, drainage	2,000	
Process and sanitary waste disposal, sewers	1,000	
Roads, drives, sidings, parking lots	5,500	
Subtotal	**$ 18,500**	
Building shell		
Foundations and floors	$ 10,000	
Steelwork	20,000	
Walls	20,000	
Roof	14,000	
Subtotal	**$ 64,000**	
Plant service improvements		
Electrical, including power supply and distribution, lighting, communications	$ 5,000	
Plant service improvements (continued)		
Heating and ventilating, including air conditioning (office), dust and fume control		6,000
Plumbing, including pumps, interior water and sewer lines, sprinklers, etc.		2,000
Subtotal		**$ 13,000**
Interior finishing: painting, plastering, floor covering and hardening		**$ 2,500**
Special facilities: None		
Furniture: None		
Professional fees: architects, engineers, and consultants		**$ 1,000**
Grand Total Cost of New Plant Building		**$ 99,000**

Turn the page

Warehouse That's Built In

BASIC COST DATA
Total cost: $4,372,000.
Year completed: 1956
Employees: office, 180; manufacturing and warehouse, 350; total, 530.
Office area: 36,000 sq. ft.
Manufacturing area: 292,000 sq. ft.
Total buildings area: 328,000 sq. ft.
Cost per square foot: $13.35
Office cubage: 360,000 cu. ft.
Manufacturing cubage (including warehouse): 6,280,000 cu. ft.
Cost per cubic foot: $0.66.

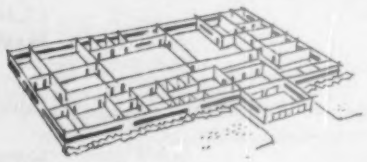
Over two-thirds of this plant (chemical specialties, Middle Atlantic) is warehouse. It's framed with steel girders and purlins. Ground floors (4000 psi.) are poured concrete. Upper floors and roofs are concrete slabs on steel framing. Walls are face brick outside, glazed tile inside. Office walls have aluminum louvers. Warehouse walls are precast panels; roof and steel deck are covered with fire-retardant adhesive bonding insulation layers.

Power: 12,000 kva. Bays: 42x42 by 20 feet overhead. Processes: mixing, blending, packaging. Last year's shipments: $25-million. Air conditioning in office and packaging areas. Vending in cafeteria.

New plant payoff—Building was erected in country town to consolidate several plants in large metropolitan area. New building has greatly eased complex materials-handling problem. Mixing and blending operations are on upper floors, packaging on lower floors.

Employee attitudes as well as attendance and turnover show big improvement since the move. Plant reached new safety record in first year of occupancy.

Small Plant—But Complete



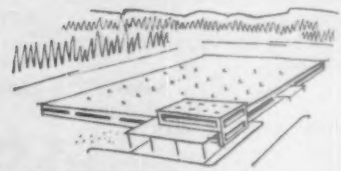
BASIC COST DATA
Total cost: $701,000.
Year completed: 1956.
Employees: office, 180; manufacturing, 410; total, 590.
Office area: 17,800 sq. ft.; manufacturing: 27,000; total area: 44,800
Cost per square foot: $15.66.
Total building cubage: 627,200 cu. ft.
Cost per cubic foot: $1.12.

Air conditioning throughout, flagstone exteriors, luxury offices—they all add to the cost of this handsome, durable New England plant. Its product and processes require high-intensity lighting, controlled atmospheres, top-flight working and relaxing conditions for its employees. The new plant provides all that.

Construction of this single-story building is post-and-beam with bar joists resting on steel I-beams. Flooring carries load of 275 psi. Sidewalls have 4-ft. brick sill beneath 30-in. strip of fixed windows in aluminum sash. Above this is aluminum sandwich wall. Roof is gypsum concrete underlaid with glass fiber and topped with built-up tar roofing. Bays are 20x20 by 13 feet overhead. Main substation is rated at 750 kva. Room for future expansion is provided on three sides of the building.

New plant payoff—Objective of new plant was to provide more production capacity. This is accomplished by 100%. Productivity per employee went up 3% concurrently. Growth of the company turned out to be faster than anticipated. Result: Already 25,600 square feet has been added to the new plant.

New Plant in Another Region



BASIC COST DATA
Total cost: $1,928,000.
Year completed: 1955.
Employees: office, 400; manufacturing, 800; total, 1200.
Office area: 33,800 sq. ft.
Manufacturing area: 158,200 sq. ft.
Cost per square foot: $10.
Office cubage: 364,000 cu. ft.
Manufacturing cubage: 3,000,000 cu. ft.

Moving to the West, as this plant did, can be quite costly when you throw in expenditures for land improvements and plant services. The flagstone office exterior of this aircraft-components plant adds to the general beauty of the structure. Mezzanines for manufacturing services (production control, etc.) and location of cafeteria in the basement get extra mileage from the construction dollar.

The building is on concrete pile foundation, with steel frame and reinforced concrete floor (load capacity, 300 psi). Roof is precast gypsum on steel frame. Walls are embossed aluminum panels. Bays are 24x32 feet with 20-ft. clearance. Main substation is 3000 kva. Main processes are light machining, heat treating, plating. Shipments last year totaled $17-million.

New plant payoff—This new plant was built to provide additional facilities, including production facilities, for the main plant. It enabled the company to meet its new production quotas completely. Nevertheless, an unexpected increase in orders required 26,000 square feet additional in 1957. Cost: $230,000.

DETAILED COST DATA

Land and improvements	
Land (110 acres)	$ 128,000
Excavation, site clearance, grading, and drainage, including water supply, wells and lines; process and sanitary waste disposal, sewers; roads, drives, sidings, parking lots	385,000
Landscaping, fences, enclosures	30,000
Subtotal	**$ 543,000**
Building shell	**$ 1,955,000**
Plant service improvements	
Electrical, including power supply and distribution, lighting, communications	$ 425,000
Heating and ventilating, including air conditioning (offices and packaging area), dust and fume control, plumbing and process piping	1,020,000
Plant Service Improvements (continued)	
Fire protection system	144,000
Equipment moving	76,000
Subtotal	**$ 1,665,000**
Interior finishing: painting, plastering, floor covering and hardening	$ 175,000
Special facilities	
Medical dispensary	$ 4,000
Elevators and lifts	30,000
Subtotal	**$ 34,000**
Furniture: None	
Professional fees: architects, engineers, and consultants	Not available
Grand Total Cost of New Plant Building	**$ 4,372,000**

DETAILED COST DATA

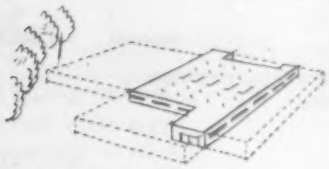
Land and improvements	
Land (10 acres)	$ 30,000
Excavation, site clearance, grading, drainage	2,500
Process and sanitary waste disposal, sewers	3,000
Roads, drives, sidings, parking lots	12,000
Landscaping, fences, enclosures	6,000
Subtotal	**$ 53,500**
Building shell	**$ 255,000**
Plant service improvements	
Electrical, including power supply and distribution, lighting, communications	$ 55,000
Heating and ventilating, including air conditioning (entire plant), dust and fume control	135,000
Plumbing, including pumps, interior water and sewer lines, sprinklers, etc.	50,000
Subtotal	**$ 240,000**
Interior finishing: painting, plastering, floor covering and hardening	$ 35,000
Special facilities	
Cafeteria	$ 25,000
First aid room	500
Subtotal	**$ 25,500**
Furniture	
Office, not including office machines	$ 12,000
Shop, including chairs, tables, benches, racks, shelves, etc.	30,000
Subtotal	**$ 42,000**
Professional fees: architects, engineers, and consultants	**$ 50,000**
Grand Total Cost of New Plant Building	**$ 701,000**

DETAILED COST DATA

Land and improvements	
Land (30 acres, including excavation, etc.)	$ 75,000
Water supply, wells, and lines	66,000
Process and sanitary waste disposal, sewers	29,500
Roads, drives, sidings, parking lots	41,000
Landscaping, fences, enclosures	11,000
Subtotal	**$ 222,500**
Building shell	
Foundations, floors, wall, roof	$ 558,000
Steelwork	156,000
Subtotal	**$ 714,000**
Plant service improvements	
Electrical, including power supply and distribution, lighting, communications	$ 202,000
Heating and ventilating, including air conditioning (office), dust and fume control	179,000
Plant Service Improvements (continued)	
Plumbing, including pumps, interior water and sewer lines, sprinklers, etc.	255,000
Subtotal	**$ 636,000**
Interior finishing: None	
Special facilities	
Cafeteria	$ 38,000
Medical dispensary	5,000
Subtotal	**$ 43,000**
Furniture	
Office, not including office machines	$ 136,000
Shop, (chairs, tables, benches, racks, shelves, etc.)	75,000
Subtotal	**$ 211,000**
Professional fees: architects, engineers, and consultants	**$ 101,500**
Grand Total Cost of New Plant Building	**$ 1,928,000**

Turn the page

Flexibility Plus Extra Services



BASIC COST DATA

Total cost: $5,174,500.
Year completed: 1956.
Total employment, office and manufacturing: 1500.
Total building area: 274,000 sq. ft.
Cost per square foot: $18.90
Total building cubage: 5,000,000 cu. ft.
Cost per cubic foot: $1.04.

High employee density, premium land values, honeycombed utilities for flexible production layout, and high-quality construction make this one-story Middle Atlantic plant expensive. Products require laboratory-type facilities, delicate machining and assembly.

Foundations are on 6-in. reinforced concrete. Framing: standard I-beam column, fabricated truss and purlin. Sidewalls: 4-ft. brick sill with 5-light windowstrip topped by textured aluminum sandwich. Sash and door trim: aluminum. Roof: precast concrete, built-up sheath. Bays: 40x40 by 16 feet overhead. Power: 4000 kva. Air conditioning: offices and only three small manufacturing areas.

New plant payoff—Plant was built for replacement of old facilities and expansion at same time. Owners call it a success. They say: "We have the advantages of a new, modern, single-story plant designed especially for our purpose—contrasted with an old, multi-story collection of buildings."

Since completing the new plant in 1956 the company has added another 40,000-sq.-ft. section.

Showplace That's Functional

BASIC COST DATA

Total cost: $4,519,500.
Year completed: 1956.
Total employees: 550
Office area: 70,000 sq. ft.
Manufacturing area: 243,000 sq. ft.
Cost per square foot: $14.40
Office cubage: 991,000 cu. ft.
Manufacturing cubage: 4,519,000 cu. ft.
Cost per cubic foot: $0.82.

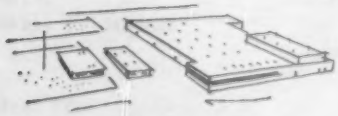
Perimeter balconies increase usable floor space in this single-story light machinery and paper coating plant in the Midwest. But a show-place reception area and a stone-faced office building (two stories) keep construction costs high.

Manufacturing building is of aluminum and galvanized iron sandwich walls on 7-ft. masonry wall. Structural steel framing is exposed. Roof is poured-in-place gypsum supported on steel beams and purlins of essentially cantilevered design. Main substation capacity is 2750 kva. Bays are 30x40 feet by 17½ feet high. Floor load capacity is 500 pounds per square foot. Office and cafeteria are completely air conditioned.

New plant payoff—Compared with the old plant, production is up 20%, productivity 15%. Quality is improved with additional equipment permitted by new work flow. New plant consolidates several different facilities and provides lower unit costs, and better working conditions.

Employee attitude is substantially improved by better working conditions. Attendance is good; turnover, down 10%.

High Bays for Heavy Loads



BASIC COST DATA

Total cost: $4,189,500.
Year completed: 1956.
Employees: office, 50; manufacturing, 900.
Office area: 20,000 sq. ft.
Manufacturing area: 458,000 sq. ft.
Total building area: 478,000 sq. ft.
Cost per square foot: $8.78
Office cubage: 180,000 cu. ft.
Manufacturing cubage: 10,900,000 cu. ft.
Cost per cubic foot: $0.38.

This single-story West Coast automobile accessory plant has minimum overhead clearance of 22 feet, reaches 38 feet in its high bays (60x40 feet). Foundation is spread footing with perimeter grade beams. Walls are 8-ft. precast concrete with sheetmetal siding above. Roof is supported by flange frame with diaphragm deck covered with 20-year built-up roofing and gravel.

Main substation (10,000 kva.) supplies power for processes: pickling, polishing, press drawing, heat treating, plating. Floor loading is 500 psi. Cafeteria and office are air conditioned. Value of shipments in 1957: $20-million.

New plant payoff—Parking area and room for future expansion were key factors in decision to build this new plant. In terms of performance it is really paying off. For instance, output is up 18%, productivity is up 6%. Employee attitude has improved correspondingly with better working conditions. Attendance has not changed substantially but the better location has cut down on turnover. Working conditions also have helped the safety record take a turn for the better.

DETAILED COST DATA

Land and improvements	
Land (129 acres)	$ 390,000
Excavation, site clearance, grading, drainage	70,000
Water supply, wells, and lines	12,000
Process and sanitary waste disposal, sewers	21,500
Roads, drives, sidings, parking lots	117,000
Landscaping, fences, enclosures	36,500
Subtotal	**$ 647,000**
Building shell	
Foundation and floors	$ 408,500
Walls, including steelwork	1,035,000
Roof	322,500
Subtotal	**$ 1,766,000**
Plant service improvements	
Electrical, including power supply and distribution, lighting, communications	$ 624,500
Heating and ventilating, including air conditioning, dust and fume control	580,000
Plant service improvements (continued)	
Plumbing, including pumps, interior water and sewer lines, sprinklers, etc.	770,000
Cranes, hoists, etc.	42,000
Subtotal	**$ 2,016 500**
Interior finishing: painting, plastering, floor covering and hardening	**$ 152,000**
Special facilities	
Cafeteria, including equipment	$ 162,000
Medical dispensary	1,500
Subtotal	**$ 163,500**
Furniture	
Office, not including office machines	$ 20,500
Shop, including chairs, tables, benches, racks, etc.	153,000
Subtotal	**$ 173,500**
Professional fees: architects, engineers, and consultants	$ 256,000
Grand Total Cost of New Plant Building	**$ 5,174,500**

DETAILED COST DATA

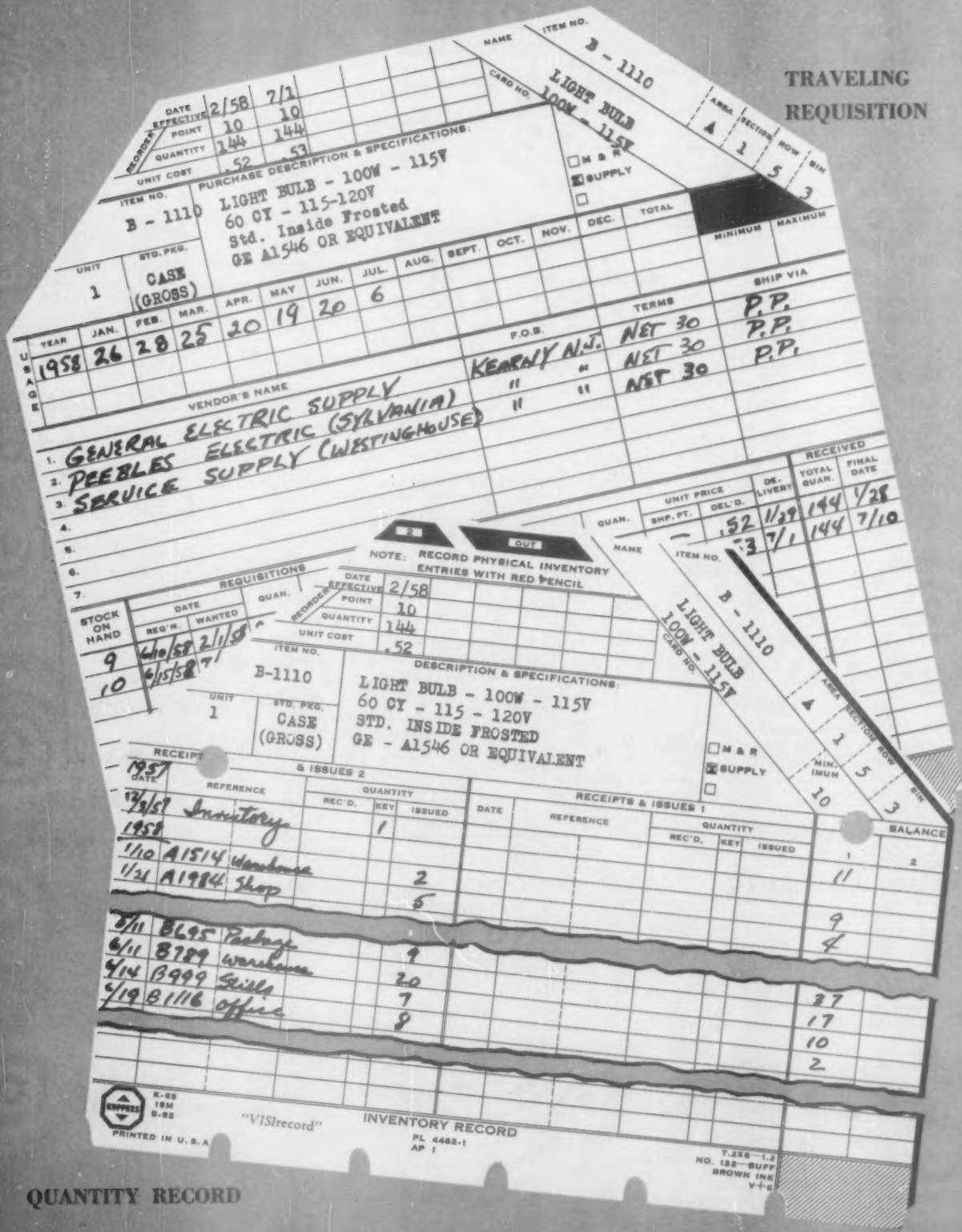
Land and improvements	
Land (18 acres)	$ 580,000
Excavation, site clearance, grading, drainage	161,000
Water supply, wells, and lines	46,000
Process and sanitary waste disposal, sewers	6,000
Roads, drives, sidings, parking lots	111,000
Landscaping, fences, enclosures	15,000
Subtotal	**$ 919,000**
Building shell	
Foundation and floors	$ 490,500
Steelwork	295,000
Walls	307,000
Roof	192,500
Subtotal	**$1,285,000**
Plant service improvements	
Electrical, including power supply and distribution, lighting, communications	$ 356,500
Heating and ventilating, including air conditioning (office and cafeteria), dust and fume control	619,500
Plant service improvements (continued)	
Plumbing, including pumps, interior water and sewer lines, sprinklers, etc.	242,500
Subtotal	**$1,218,500**
Interior finishing: painting, plastering, floor covering and hardening	**$ 491,500**
Special facilities	
Cafeteria, including equipment	$ 124,000
Medical dispensary	7,000
Subtotal	**$ 131,000**
Furniture	
Office, not including office machines	$ 114,500
Shop, including chairs, tables, benches, racks, shelves, etc.	80,000
Subtotal	**$ 194,500**
Professional fees: architects, engineers and consultants	**$ 280,000**
Grand Total Cost of New Plant Building	**$4,519,500**

DETAILED COST DATA

Land and improvements	
Land (50 acres)	$ 476,500
Excavation, site clearance, grading, drainage	165,000
Water supply, wells, and lines	45,000
Process and sanitary waste disposal, sewers	95,000
Roads, drives, sidings, parking lots	133,500
Landscaping, fences, enclosures	42,500
Subtotal	**$ 957,500**
Building shell	
Foundation and floors	$ 277,000
Steelwork	584,500
Walls	715,000
Roof	286,000
Subtotal	**$1,862,500**
Plant service improvements	
Electrical, including power supply and distribution, lighting, communications	$ 715,500
Plant service improvements (continued)	
Heating and ventilating, including air conditioning (office and cafeteria), dust and fume control	45,000
Plumbing, including pumps, interior water and sewer lines, sprinklers, etc.	289,000
Boiler room equipment	58,500
Subtotal	**$1,108,000**
Interior finishing: painting, plastering, floor covering and hardening	**$ 34,500**
Special facilities	
Cafeteria, including equipment	$ 127,500
Medical dispensary	8,500
Subtotal	**$ 136,000**
Furniture: None	
Professional fees: architects, engineers, and consultants	**$ 91,000**
Grand Total Cost of New Plant Building	**$4,189,500**

These two forms tell the facts about maintenance stores

TRAVELING REQUISITION



QUANTITY RECORD

Surest Stores Control Yet

Quick and easy, too. And if you want still more smart ideas for your maintenance storeroom, turn to the two articles that begin on pages 98 and 126.

TWO FORMS (facing page) are the key to maintenance stores control at the Tar Products Division, Koppers Company, Inc. (Pittsburgh). Here's what Maintenance Engineer George Hill Jr. reports:

"The system worked so well in our largest plant that we are now successfully applying it in many more of our plants."

What's the system doing for Koppers? Plenty. Following are some of its many benefits:

. . . *Reduces the writing* of purchase requisitions to a few strictly non-repetitive items.

. . . *Simplifies record-keeping*, receiving, invoice-checking, and other related paperwork.

. . . *Saves time* in purchasing—gets quick action.

. . . *Tells what's in stock* without going to bin.

. . . *Speeds up posting* of withdrawals and pricing of work orders.

HOW THE SYSTEM LOOKS

A set of these two VISIrecord cards is made out for each storeroom item. Cards are filed by code number in a tub file. The quantity record (lower half of the facing page) is buff color. The traveling requisition (upper half of the facing page) is pastel green. There's a half-inch difference in height that makes it easy to locate the top card, which is used more often. Green showing through the peekhole near the right diagonal edge of the buff-colored quantity card shows quickly whether the traveling card is in or out of the file.

HOW IT WORKS

All stores issues must begin with a written requisition. Copies go to record clerk for pricing and posting onto buff card. Duplicate requisition goes on to maintenance clerk for checking with service orders, posting onto equipment records.

During posting, if the supply clerk sees stock balance is at a minimum, he removes green traveling requisition, enters data (stock on hand, reorder quantity, date, when wanted). His supervisor checks data, considers changes in specification and reorder quantity, approves and forwards to central purchasing. All data for action are on this requisition—no need to dig into files.

When purchasing issues order, it adds new data, returns card to supply clerk, who files it in front of buff card. When material is received, he enters receiving data on cards, refiles green behind buff.

Non-stock items? The storeroom sends a standard company purchase requisition to purchasing.

WHAT IT COSTS

Installation of a 7500-card system took Koppers about three and a half months. Usually this sort of operation takes one supervisor and a clerk, two stock men, and a part-time typist—all for a single (day) shift. For other shifts, one man each. But to install the system two extra men and a typist were needed.

These men inventoried and listed every item in the storeroom by name, description (including previous purchasing data), quantity in stock, and location. Reorder data were ironed out by conference with the proper maintenance people. Inventorying was speeded up by penciling entries on a mimeographed form containing spaces for all "static" data you see on upper section of the quantity record. From it the typist filled in cards a set at a time (using hard carbon), thus gradually built up the file to complete coverage.

HOW IT CONTROLS

Key to control is the reorder point and quantity data at top of both cards. Such data must be carefully established to prevent overstock and to guard against obsoleteness. Whether you use simple or complex formulas to do this, usage data are essential. They appear near the top of the traveling requisition. Supply clerk enters totals for the past month during daily posting of current issues. Year's total is entered each January. These two cards give all the facts, at all times, for easy establishment and practice of inventory controls for any size maintenance storeroom.

How Managers Spend Their Time in the Plant

	Time Spent by . . .			
	. . . Top Plant Management*		. . . Operating Managers†	
TALKING (Oral Communication)	**Per cent of time**	**Hours per month**	**Per cent of time**	**Hours per month**
Consultation	10.5	14.2	3.6	4.8
Deciding on course of action	9.4	12.6	6.3	8.5
Discussion	6.2	8.3	4.0	5.3
Interviewing visitors	3.0	4.0	3.5	4.7
Telephone:				
Alone	8.8	11.8	7.1	9.6
Others waiting			1.1	1.5
Dictating:				
To secretary	3.7	5.0	0.3	0.4
To dictating machine			1.6	2.2
Meetings:				
Regularly scheduled	1.4	1.9	4.0	5.4
Special	8.0	10.8	6.0	8.1
Luncheon discussions	14.3	19.4	11.0	15.0
Visiting other offices	14.7	20.0	36.1	48.9
TOTAL TALKING	80.0	108.0	84.6	114.4
WRITING				
Letters	1.4	1.9	1.8	2.4
Notes	2.7	3.7	2.0	2.6
READING				
Published material	13.2	17.7	2.6	3.5
Correspondence			5.8	7.8
Form data			0.8	1.1
MISCELLANEOUS				
Clerical work	0.7	1.0	1.2	1.6
Thinking	2.0	2.7	1.2	1.6
TOTAL	100.0	135.0	100.0	135.0

* General Manager, Plant Manager, Director of Industrial and Public Relations, etc.
† Managers of Operations, Quality Control, Industrial Engineering, etc.

8 Tips to Help You Save Time

As a plant operating manager you spend nearly all of your time in talking, listening, reading, and writing. Here's how to make every minute count.

TALK, TALK, TALK. That's a quick summary of your life at the plant (see table above). No question, the largest chunk of your time is spent in communication.

The operating managers who make up this study were all busily at work at their regular jobs (at Wolverine Tube Division, Calumet & Hecla, Detroit) when this work sample was taken. The conclusions are the result of 5250 observations of managers taken over 15 weeks.

After all the data were in, each manager got a report of his time usage as it compared with the average for all managers in the study. But that wasn't the end of it.

Next step was for the managers themselves to suggest ways to make their communications work easier, faster, better. Here are the best eight ideas they came up with:

By C. L. BRISLEY, Ph.D
Wayne State University
Detroit, Mich.

TIME-TRIMMERS FOR YOU

1. Don't waste time fighting interruptions. No matter how you try, you can't eliminate them.

2. Organize your dictation in advance. Use a rough copy for complex letters.

3. Answer your own phone. It makes workers as well as outsiders feel "you can be reached."

4. Don't let your phone interrupt meetings, though, unless your secretary feels the call is urgent.

5. Make arrangements for out-of-town visitors in advance.

6. Plan all your meetings, even those with only one other man.

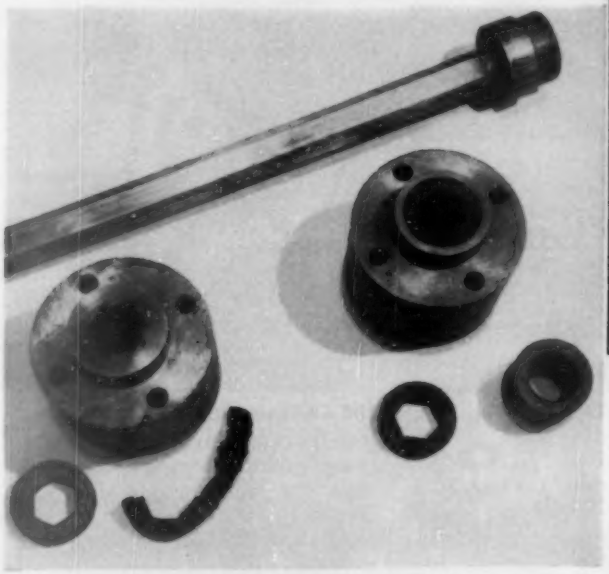
7. Set up standing meetings in advance, perhaps once a year. And provide an agenda for all members well in advance for each meeting.

8. Count on conferees to gather the facts they'll need for each meeting. Otherwise, you'll do the whole fact-gathering job.

"Cast Urethane* parts that outwear steel cut maintenance costs 65% on this pneumatic hammer..."

says H. B. Minturn
Mechanical Superintendent
The Ormet Corporation†

Urethane elastomer components replaced machined steel parts in these pneumatic hammers; show no sign of wear after four months of punishing use, says Ormet's H. B. Minturn (right).



After comparable periods of service, superior wear resistance of cast urethane bushing (right) over machined steel shaft guide with lead graphite packing (left) is obvious. Resiliency of urethane inserts also reduces angular stress on shaft in operation.

"The replacement of steel inserts with cast urethane parts in our pneumatic sand ramming hammers has resulted in a two-thirds reduction in maintenance, with attendant savings in cost of spare parts," says Mr. H. B. Minturn of Ormet Reduction Plant, Hannibal, Ohio.

The steel nose pieces of the rammers, used to tamp a 12-ton mixture of calcine, anthracite coal and foundry coke which lines the cathodes of large electrolytic cells for producing pure aluminum, had a service life of only one to two months. Lead packings lasted less than half that long. "This meant we were losing 2½ hours of potential production time to maintenance every time one of these units had to be torn down to replace the worn parts," Mr. Minturn adds.

"Cast urethane parts have eliminated these problems. The urethane linings in the nose pieces and packing rings seem to be indestructible and show no signs of wear after four months of constant use. The use of urethane parts has given us an added advantage by enabling us to redesign the gasketing to include grease rings which further reduce wear on the shaft and other working parts.

"To sum up, we have really found a tough, friction-resistant material in this elastomer—one which is easily machinable, resilient and low in cost."

†The Ormet Corporation, jointly owned by Olin-Mathieson and Revere Copper and Brass, Inc., is typical of the basic industries that are finding urethane elastomer a ready-made answer to some of their toughest maintenance problems.

MOBAY
CHEMICAL COMPANY
Dept. F-2 · Pittsburgh 34, Pa.

MOBAY
First in Urethane Chemistry

*The exceptional properties referred to in this application story are obtainable only in urethane elastomers made with Mobay's chemicals. Write to Mobay Chemical Company for technical details and sources of fabricating assistance.

For more facts Circle 483 on Reader Service Card

EQUIPMENT NEWS

For more about these items, circle numbers on Reader Service Card next to back cover.

NEWEST WAY TO SAVE PAINTING MONEY. IT'S AN . . .

Electrostatic Hand Spray Gun

It puts paint where it's meant to go —without waste, and with absolute safety. Using electricity instead of compressed air for atomization, the quiet-operating electrostatic hand gun atomizes paint so fine it's hard to see. It makes paint behave with no overspray loss, attracts paint to articles the way iron filings attract to a magnet. Works fast on tubular articles because "wrap-around" electrostatic spray paints all sides of such shapes from one side only.

In recent field tests (like chair painting operation above), users report painting two to six times as many parts per gallon as with conventional air-spray guns; production increases up to 200%; up to 75% reduction in spray booth maintenance cost; less air make-up for finishing department; and high quality finish. Gun is easy to handle; operators quickly learn how to use it.

Ransburg Electro-Coating Corp. (Circle 101, Reader Service Card.)

102—Fire-Resistant Coveralls, overalls, aprons, and other clothing items, made of flameproofed cotton cloth, are recommended for spot welding, drop forging, similar exposures. Material is light, long-lasting. *American Optical Co.*

103—Miniature Flow Meter (under 5-in. over-all) shows if fluid flow is taking place and meters the quantity. Unit is suitable for maximum pressure of 100 lb./sq. in. and can be inserted into a ¼-in. IPS pipe line. *Henry G. Dietz Co.*

104—Air Meter Kit provides in a pocket-size plastic case a complete test kit for air velocity and static pressure measurements. Air meter gives direct readings for furnace draft, duct air velocity, and so on. *F. W. Dwyer Mfg. Co.*

105—Silicone-Rubber-Motor insulation system, available on many ratings of firm's form-wound motors, seals out moisture and dirt, and eliminates the need for costly protective enclosures. Glass fabric adds strength to the silicone rubber. *General Electric Co.*

106—"Swaptops" give you custom, quick-change production work tables. Cam-latch devices, instead of nuts, bolts and screws, permit fast, rigid assembly. Standard 4-, 5-, 6-ft. steel ribbed frames, 24- and 30-in. deep; work tops of various materials. *Johnson Products, Inc.*

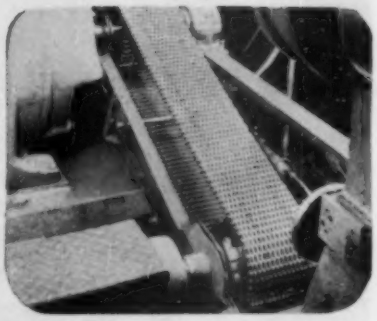
107—Splash-Proof Machine Light serves where moisture, dirt and chips are a problem. Using two 4-watt fluorescent lamps and ballast in a sealed reflector, the light provides 500 ft.-candles for precision work. Plastic shield is quickly wiped clean. *Stocker & Yale, Inc.*

108—Steel Drum Head Cutter is hand-operated, portable, fast, and safe. It cuts "thin-wall" containers in 2 min., will also cut heads out of 18- to 22-gage steel shipping drums. It forms a pressed-in flange, leaves no ragged edge. *Michael A. Schinker Mfg. Co.*

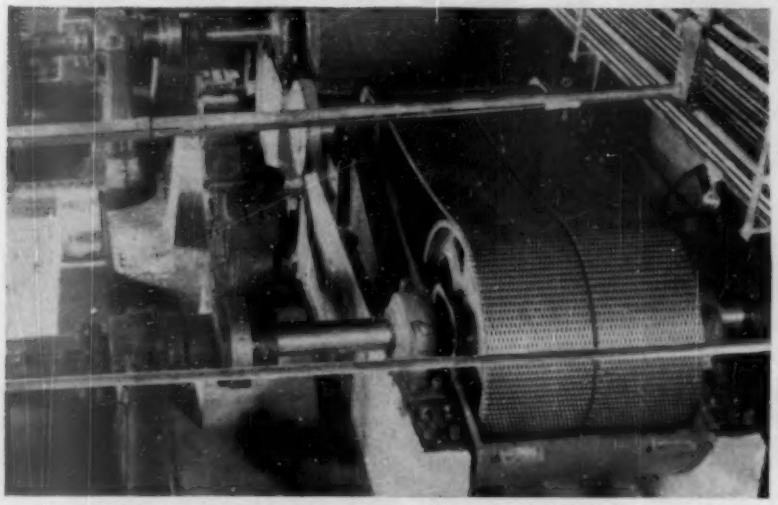
Turn the page

How LINK-BELT silent chain comes through industry's stiffest tests

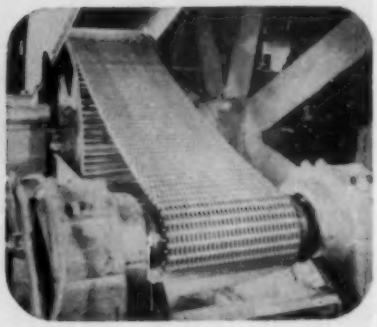
No other drive can do the same



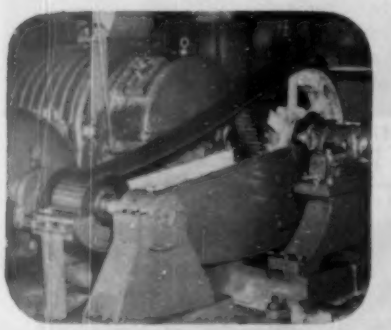
HIGH SPEED. Link-Belt silent chain drives on newspaper presses often operate at speeds of 4000 to 5000 feet per minute.



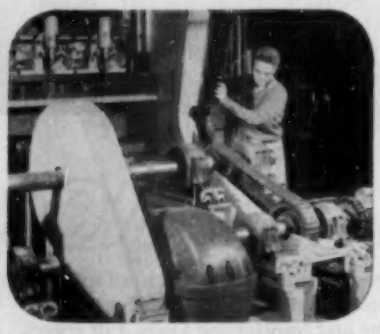
LARGE OR SMALL HP. Two 24-in. strands of Link-Belt silent chain on turbines powering 850-kw generators comprise one of the largest chain drives ever built. Silent chain provides high efficiency over (98%) on large or fractional hp drives.



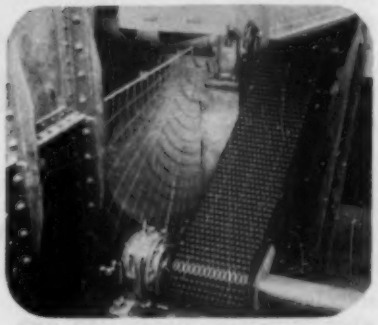
ADVERSE OPERATING CONDITIONS. Effects of heat, humidity and cold are minimized with Link-Belt silent chain drives.



LARGE RATIOS. Link-Belt silent chain operates efficiently at ratios as high as 10-to-1, with resulting space economies.



LIMITED SPACE. Easy to assemble in close quarters, Link-Belt silent chain permits built-in drives, compact housings.



LONG LIFE. Link-Belt silent chain has given more than 30 years of uninterrupted service on ventilating systems.

Ask your Link-Belt office or authorized stock-carrying distributor for

88-page Book 2425

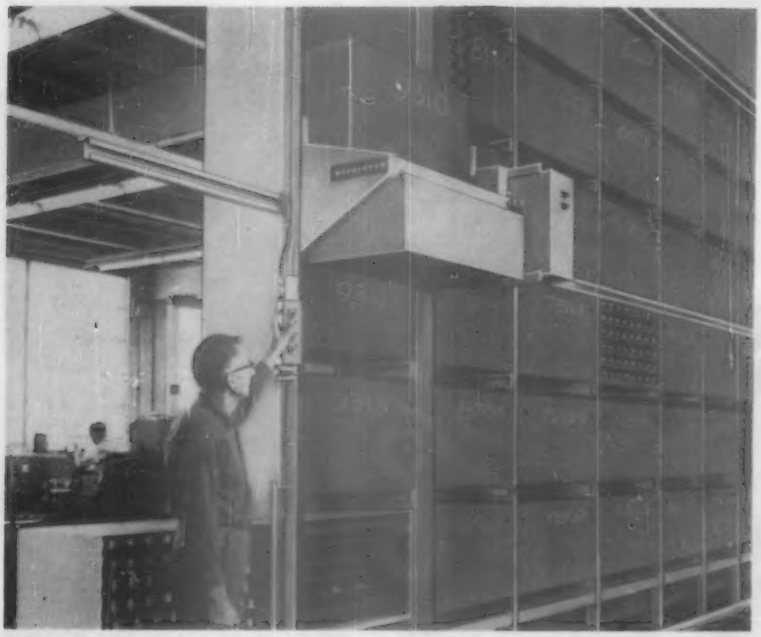
LINK-BELT

SILVERSTREAK SILENT CHAIN DRIVES

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 14,680

For more facts Circle 484 on Reader Service Card

For more about these items, circle numbers on Reader Service Card next to back cover.



Floor-to-Ceiling Storage Wall

This "wall" comes to life at the touch of a button for storage or delivery of parts or materials. The wall is part of a new mechanical storage system which includes an electrically operated traveling carrier and a compact loading or transfer station. At the touch of a selective control, carrier unit picks up load to be stored, transports it vertically and horizontally to any desired niche, then rolls it gently into a drawer. Retrieving the load is accomplished in the reverse direction, with the same automatic ease.

Materials to be stored can be handled on skids or pallets, and in bins or trays, in units weighing up to 4000 lb. In a manufacturing process where there are surges, the system provides on-the-line storage as part of the process.

Triax Equipment (Circle 109, Reader Service Card.)

110—"Slap Board" is a dandy black flannelboard you can set up on easels for visual presentations at training and other meetings. Props can be photos, signs, cut-out figures. Sandpaper glued to back of the props stick to nap of flannelboard. *Arlington Aluminum Co.*

111—Folding Barricade Kit is useful for intra-plant traffic control, on the grounds or inside buildings, wherever construction work is going on. The portable barricade, painted traditional yellow and black, comes in kit complete with flasher light. *Pacific Mercury.*

112—"Cylindri-Pak" is a new cylindrical wirebound pallet box designed for storing and shipping free-flowing granular materials. These lightweight, low-cost containers hold up to 4000 lb. without bulging. And are easily assembled, stacked, emptied. *General Box Co.*

113—Electronic Thermometer is a portable instrument (7x5x2¼ in.) that's carried on a strap around the neck and operated by standard batteries. Over 100 probes available for various liquid, gas, surface measurements between -60 and +845 F. *Atkins Technical, Inc.*

A Fast, Smooth-Positioning New Hoist

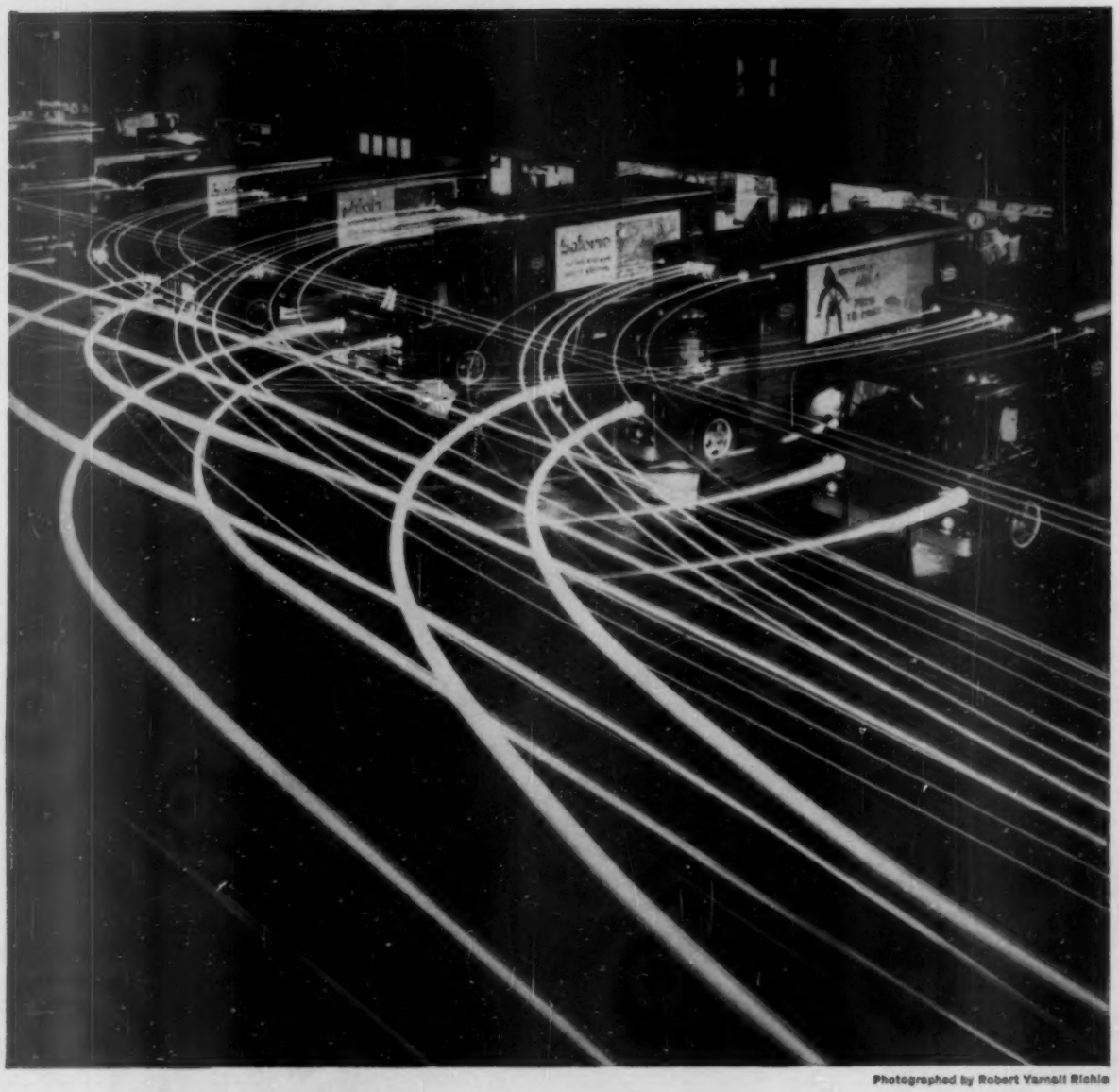
You get faster, smoother vertical positioning—no jogging or jolting—when positioning delicate loads with this rugged new electro-hydraulic servo-hoist. It extends to lift operations the speed, control, power, and safety characteristics of hydraulic actuation. Materials can be raised up to 10 ft. with any of four new models having capacities from ¼ ton up to 2 tons.

New hoist design features precision positioning, adjustable-speed action, one-hand operation, and finger tip control. Hand movements on the handle are translated into direction and speed for raising, lowering and transferring loads. Lift speed is up to three times that of conventional hoists, with smooth acceleration and precise stopping. Speed variation is stepless and infinitely variable.

Hoist is available with or without power trolley. And power failure won't affect either load holding or lowering.

Pesco Products Div., Borg-Warner Corp. (Circle 114).

Turn the page



Photographed by Robert Yarnall Richie

Really on the move

Shipping that's going places! Every four minutes, night and day, a Railway Express truck enters or leaves this terminal. The new Railway Express trucks you see everywhere are part of the biggest new civilian truck order in history. And the largest, most modern truck fleet of any private carrier is only one feature of the Railway Express multimillion-dollar modernization program to insure you faster, more complete service.

Your shipment moves swiftly to almost anywhere in the world—with unified *one-carrier* responsibility all the way. You get door-to-door delivery at no extra charge within REA vehicle limits in the U.S.A. . . . and special low rates on many commodities. Next time you want safe, swift, sure shipping—call Railway Express!

shipping goes MODERN with

RAILWAY EXPRESS AGENCY

RAIL • AIR • SEA

115—Assemble-It-Yourself machine tool kit gives you "3-D" plant layout models at low cost. Kit includes planing mills, lathes, drilling and sawing machines, office equipment —all scaled to size and ready for final assembly and painting. *Scott Industries, Inc.*

116—Cup-Type Safety Goggles feature a removable soft sponge face pad with snaps at top and bottom. Pad quickly snaps in, snaps out for cleaning or replacement. The goggles have heat-treated lenses, perforated side shields for ventilation. *Bausch & Lomb Optical Co.*

117—Pocket Magnifying Comparator performs at low cost many functions of expensive projection-type optical comparators. It compares small parts with transparent, dimensional-scale pattern, instantly revealing accurate plus or minus measurement. *Finescale Co.*

118—Flame Cutting Machine is controlled directly by 60x150mm. photographic glass negatives made from drawings. All preparatory work is done in drafting room; plates and negatives come to machine, need no other template preparation or plate layout. *Hudson Equipment.*

119—That Better Mousetrap has been built at last! It's an aquatic trap that's big enough to catch 100 or so mice at a single setting. No poison. No electricity. The mice simply "walk the plank"—and take a dive into the drowning tank. *Self-Sett Mousetrap Co.*

120—Mechanical Seal, using precision-lapped faces, minimizes downtime when replacing packing in a centrifugal pump stuffingbox or the gland of a rotating shaft. This shaft-sealing device withstands extreme temperature and pressure. *Borg-Warner Mechanical Seals Div.*

121—Air Booster automatically boosts airline pressure in surge tanks and die cushions—meets any other boosting need. Booster is completely valved, ready to operate, needs only two connections. Units furnished in varying ratios from 15:1 to 6.25:1. *Lynair, Inc.*

122—Machine-Management System permits operators to "dial" changes in machine set-up remotely. Electromechanical package system functions by amplifying electrical signals and moving workpiece to any preselected position set on the dial. *Seneca Falls Machine Co.*

123—Electronic Tank Drain answers the air compressor-water nuisance problem. Small drain (2⅜x 2⅜x8¼ in.) attached to or near the air compressor, automatically purges water accumulation—and deters rust and odors, prolongs tank life. *Squire-Cogswell Co.*

124—"Jet" Tool cleans paint brushes fast. It attaches to any ¼-in. drill and spins a paint brush free of solvent-thinned paint in seconds. Locking device holds brush handle securely during cleaning, and bristles aren't damaged by spinning action. *Chemtor Products Co.*

Quick Sludge Removal

Mechanical Sludge Bed Cleaner, operated by one man and using a tractor for motive power, can clean up to 3100 sq. ft. of sludge bed per hour—with annual savings of 60% over manual methods. The two hydraulically operated forked scoops, when raised, dump the sludge into two conveyor troughs behind them. From the troughs sludge is conveyed to a flight conveyor, discharged into a truck behind the tractor. *Link-Belt Co.* (Circle 125)

Turn to page 70

Positive Protection Against Phase Failure and Phase Reversal ?

Here is your answer!

The Allen-Bradley Bulletin 812 Type F, Type R, and Type RF relays provide positive protection against the hazards to men, motors, and driven machinery, resulting from phase failure and/or phase reversals.

The Bulletin 812 Style F phase failure relay employs a unique static sensing network that responds to all open phase conditions on a motor branch circuit and immediately removes the motor from the line . . . irrespective of the load on the motor (including no load), or the circuit arrangement. This relay even responds to hard-to-detect primary failures on a wye-delta transformer with ungrounded neutral. Furthermore, the five-cycle response prevents nuisance "drop-outs" from transient fluctuations.

The Bulletin 812 Style R phase reversal relay disconnects the motor from the line—whether it is running or not—when a phase reversal occurs anywhere in the system on the line side of the relay. Thus, it can be employed for a single motor, a group of motors, or an entire power system. In addition, the phase reversal relay prevents the motor from starting should phase failure occur while at a standstill—a vital feature for elevator applications.

The Bulletin 812 Style RF relay combines the elements of Style R and Style F relays for protection against both phase failure and phase reversal. All Bulletin 812 relays are inherently "fail safe." Send for complete information.

Allen-Bradley Co., 1316 S. Second St.
Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd.
Galt, Ont.

ALLEN-BRADLEY
QUALITY
MOTOR CONTROL

12-58-MR

Bulletin 812, Style RF for Phase Failure and Phase Reversal

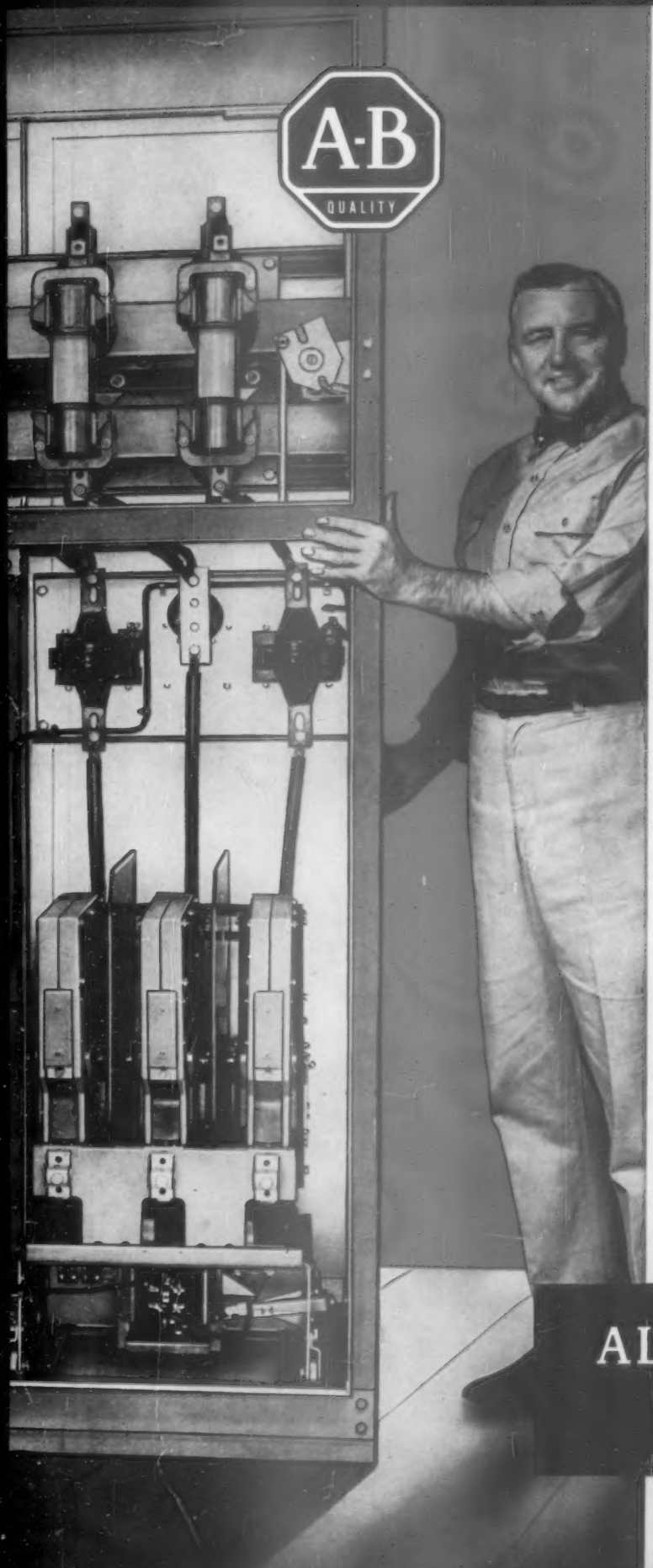
INDIVIDUAL RELAY UNITS AVAILABLE

For Phase Failure

Style F covers full load currents from 1.5 to 300 amp in 4 sizes. Coils for up to 600 v, 60 cycles.

For Phase Reversal

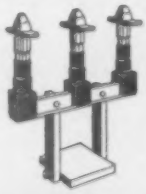
Style R made with coils for 110, 208/220, 440, 550 v for either 50 or 60 cycle operation.



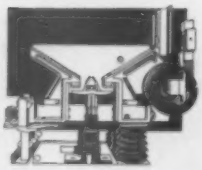
Tough high-voltage job?...Here's the answer!

Allen-Bradley High-Voltage Air Break Starters are ideal for frequent switching, reversing, plugging, or jogging.

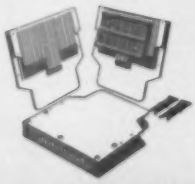
A tremendous operating life has been built into these high-voltage air break starters . . . resulting from the use of the simple solenoid contactor. It's the same design—having only ONE moving part—that provides millions of trouble free operations in Allen-Bradley's low-voltage controls. These starters are made in a complete line for all types of service. Send for Publication 6080, today.



ONLY ONE MOVING PART
With this simple solenoid design, all trouble causing pivots, pins, and flexible jumpers are eliminated. Straight up-and-down motion of contactor is virtually frictionless.



DOUBLE BREAK CONTACTS
Allen-Bradley silver alloy contacts never need maintenance . . . they remain in perfect operating condition until completely worn away. Vertical motion assures uniform contact pressures at all times.



FASTER ARC SUPPRESSION
The air break contactor employs a completely different blowout design and novel arc chute which assure rapid arc extinction. Chutes are molded from arc resistant material.

ALLEN-BRADLEY
MOTOR CONTROL

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

12-58-M

Hall Industrial Water Report

VOLUME 6 DECEMBER 1958 NUMBER 6

From Kerosene to 100 Octane

The cat crackers of today's oil refineries bear little resemblance to the batch stills of yesteryear. But the old and the new do have one thing in common—water problems. Treatment of water for boilers has become more critical because of higher pressures and ratings and greater necessity for avoiding interruptions in production. The same is true of service and cooling water treatment. And waste water problems are becoming more acute because of the pressure to conserve water and clean up our lakes and rivers.

Hall Laboratories engineers have been working with water in refineries as well as in other industries for more than thirty years. They are ready to help you with all your water problems.

Sweetening Sour Water

Deposits formed so rapidly in the sour water deodorizing tower at a Canadian oil refinery that chemical cleaning was required every month. Each cleaning job cost $600.

When he learned of the problem, Hall engineer J. S. Sullivan recommended the use of Calgon and Hagan Dispersive. The cost of these chemicals would be only a fraction of the cost of chemical cleaning.

After treatment was started the tower operated without any indication of deposit formation and inspection was postponed for three months. When the tower was inspected, Sullivan and the operating men were gratified to find it clean.

Failure in Sixteen Days

A Northwestern oil refinery installed two boilers, and a hot process lime-soda softener to treat the hard, high solids feedwater. Operation was started without phosphate conditioning of the boiler water and sixteen days later one boiler was out of service with ruptured tubes as a result of scale formation.

In response to the call for help a Hall engineer left for the plant immediately. He found that plant operation depended upon keeping the remaining boiler in service. This seemed doubtful because a peek into the furnace revealed overheated spots on many tubes, a literal red light warning of insulating scale within them.

There was no time to start with a low phosphate feed and to gradually build it up so as to avoid rapid loosening of scale and possible tube blockage. Full phosphate conditioning was started at once. Then the Hall engineer had to sweat it out. Would there be tube trouble? Would carryover occur because of high concentrations? Fortunately, neither occurred. Within 24 hours the overheated spots disappeared and everyone relaxed.

Without proper conditioning of the boiler water, tubes failed in sixteen days. Following the establishment of desirable conditions many years passed without further difficulty.

Saving by Wasting

A petrochemical plant used well water for cooling in once-through services which required colder water than the cooling tower could deliver. Practically all of the well water was then discharged to the cooling tower system as make-up. Since this was far more water than was actually required for make-up, the amount of blowdown from the recirculating cooling system was about four times what it should have been.

Treatment of the recirculating cooling water for corrosion control involved the use of sulphuric acid, Calgon® and Coraid.® Hall engineer S. R. Osborne pointed out that the excessive blowdown was resulting in the wastage of large amounts of chemicals—more than $60.00 worth a day. He recommended that this be saved by discharging to the sewer all of the well water not actually required for make-up to the recirculating cooling system.

In most plants Hall engineers are looking for ways to save money by reusing or recovering cooling and waste water. In this case the plant could save about $22,000 annually by wasting rather than recovering once-through cooling water.

Pitted Gauge Glasses

A very common problem often puzzling to boiler operators is the internal wastage of glass above the water level in gauge glasses. Water level visibility is impaired and sometimes the glasses are weakened to the point of failure.

When this problem was first referred to Hall Laboratories years ago, study by the Hall research staff revealed an interesting process of corrosion.

Steam is continually condensing on gauge glasses above the water level. The hot, pure water slowly dissolves the glass. Sometimes dissolved silica reprecipitates as an opaque deposit which imparts a frosted appearance to the glass.

There is no way to modify boiler water treatment to prevent or control the trouble. When flat or prismatic glasses are affected replace them with mica-backed flat glasses. When tubular glasses are involved, try to obtain a more resistant glass.

Free Copies of Water Lecture Available

A limited number of free copies of "Your Most Important Raw Material," the Edgar Marburg Lecture by Dr. Everett P. Partridge, are now available. For your copy or for information on how the Hall System can help solve your particular water problems, write, wire or call address below.

Water is your industry's most important raw material. Use it wisely.

HALL LABORATORIES
DIVISION OF HAGAN CHEMICALS & CONTROLS, INC.
HAGAN BUILDING, PITTSBURGH 30, PENNSYLVANIA
DIVISIONS: CALGON COMPANY, HALL LABORATORIES
IN CANADA: HAGAN CORPORATION (CANADA) LIMITED, TORONTO

Hall Laboratories—Consultants on Procurement, Treatment, Use and Disposal of Industrial Water

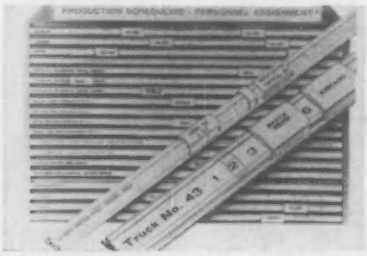
For more about these items, circle numbers on Reader Service Card next to back cover.

126—See-Through Saw Guard made of ½-in.-thick transparent plastic protects users of table saws during operation. The guard may be locked in a variety of operating positions to prevent physical contact with the blade and eliminate flying chips. *Brett-Guard Corp.*

129—Desk and Drawing Board Combo unit looks like ideal work center for engineers. All-steel, L-shaped unit provides 27 sq. ft. of work surface, puts drawing board within a short idea's distance of the creative man at the desk. *Standard Pressed Steel Co.*

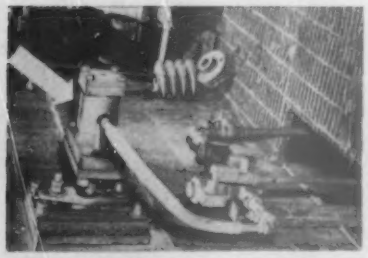
132—Plug-In Lighting Fixture is a vaportight model, useful in areas where an ordinary fixture would be in the way most of the time, but where light is sometimes needed. One quick-disconnect fixture like this can be used to do the work of many. *Crouse-Hinds Co.*

127—Single-Phase Motors avoid contamination of vital elements by completely encapsulating them. Inside sealed capsule are the capacitor, starting switch, actuator, thermostat, and terminal board. Models include ¼- to 3-hp. sizes on the 56 frame. *A. O. Smith Corp.*



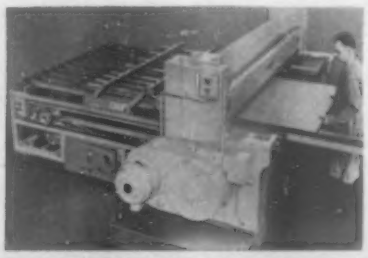
130—Control Board has all working parts made of clear plastic—for maximum visibility. Boards are up to 40 in. wide, hold up to 100 parallel moldings which snap in or out. Colored paper strips carrying printed data slide into the moldings. *Acme Visible Records, Inc.*

133—All-Aluminum Tub Truck is useful wherever individual parts, pieces, or parcels are handled. Floating deck feature is a real back saver—it keeps load always within easy reach of operator. Available in many standard sizes, built-to-order models. *M. Neushul Co., Inc.*



128—High-Impact Air Vibrator reduces maintenance on electrostatic dust collectors. Unit boasts one-piece, heavy-duty construction; piston is the only moving part. Vibrator can be arranged with timer and solenoid valve for automatic control. *National Air Vibrator Co.*

131—High-Power Ultrasonic Cleaner, known as Series 5000 Son-Blaster, can clean large assemblies as well as big loads of small parts in just one minute. Unit combines 40-kc., 500-watt generator and a 10-gal. transducerized cleaning tank. *Narda Ultrasonics Corp.*



134—High-Speed Shear-Pacer unit gages and feeds sheet coil or strip stock in standard square shears to provide automatic trim or cutoff operations. Unit advances stock to gaging fingers, operates shear, carries trimmed sheet to stacker. *Press Automation Systems, Inc.*

Turn the page

LOOK *at the hazards in floor maintenance*

SLIPPERINESS

Taking slipperiness out of your floors is worthwhile insurance against slips and falls.

It's easily done with a specially blended West resin emulsion. This safe, high-traction finish contains no wax — yet produces a glossy, hard, durable film on all types of floors.

Slipperiness is only one of many floor problems. Others are just as common. Staining. Dirt retention. Excessive dust. High labor costs. To name a few. All can be prevented — often at reduced cost — with a complete WEST FLOOR CARE PROGRAM.

The WEST FLOOR CARE PROGRAM consists of three basic steps. Cleaning. Sealing. Maintaining. Each adapted to the individual needs of floors by West Representatives who specialize in methods as well as materials.

We'd be glad to show you how a WEST FLOOR CARE PROGRAM protects floors, modernizes methods, eliminates hazards. Write, or telephone your local West office.

Programs and Specialties for Protective Sanitation and Preventive Maintenance

WEST CHEMICAL PRODUCTS INC.

WEST DISINFECTING DIVISION

WEST CHEMICAL PRODUCTS INC., 42-16 West Street, Long Island City 1, N. Y.
Branches in principal cities • In Canada: 5621-23 Casgrain Ave., Montreal

☐ Please send your 32-page booklet, "The Proper Care of Floors."

☐ Please have a West Representative telephone for an appointment.

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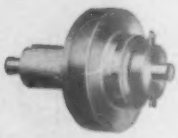
For more facts Circle 489 on Reader Service Card

DODGE PRODUCTS you should know

AIR-GRIP
CLUTCHES
Amazing sensitivity—instant response!



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CLUTCHES
Rugged! Compact! Completely enclosed!

ROLLING GRIP
CLUTCHES
Positive! Smooth! No toggles!

●

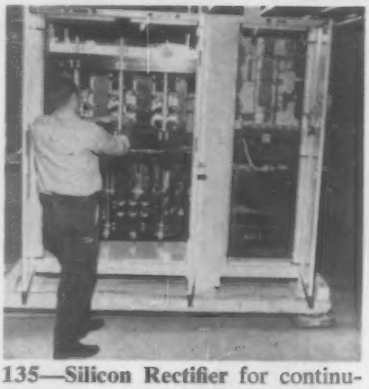
FREE Engineering Catalog!

320 pages of helpful information and technical data on Dodge products. Virtually a manual on mechanical power transmission machinery. Sent free if requested on your company letterhead. Please give your title.

DODGE MANUFACTURING CORPORATION
400 Union Street • Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

For more about these items, circle numbers on Reader Service Card next to back cover.



135—Silicon Rectifier for continuous processing uses sealed water-cooled bus bars for cell-cooling. Ratings to 10,000 amp. at voltages up to 300 v.; saturable reactor provides current limiting and stepless control from 10 to 125% current output. Panel lights, alarm indicates faults. *General Electric Co.*

136—Safety Lock Attachment transforms any fork lift truck into a safe overhead lifting unit for heavy loads. When device is slipped onto forks, two knife-edged levers grip forks tightly as load is applied. These levers are easily slipped off when load is released (no wrenches, no adjustments). *Merrill Brothers.*

137—Fold-Away Lunch Table with benches solves seating-for-eating problems in crowded areas and permits small group gatherings. Table folds and unfolds in one operation, stores away compactly. Comes in three new smaller sizes—6, 7, and 8 ft. *Haldeman-Homme Mfg. Co.*

138—Trailer for palletless freight handling speeds warehouse handling time. Outbound freight is loaded from stock onto trailer coupled to train; tractor tows train to loading dock where multiple fork lift truck picks off the freight. *SI Handling Systems, Inc.*

139—Tuned Frequency Conveyor boasts initial cost and maintenance upkeep far below that of simple belt conveyor. These non-jamming units handle materials at feed rates to 40 fpm.; have trough widths from 4 to 12 in., single-section lengths from 2 ft. *Campbell Machines Co.*

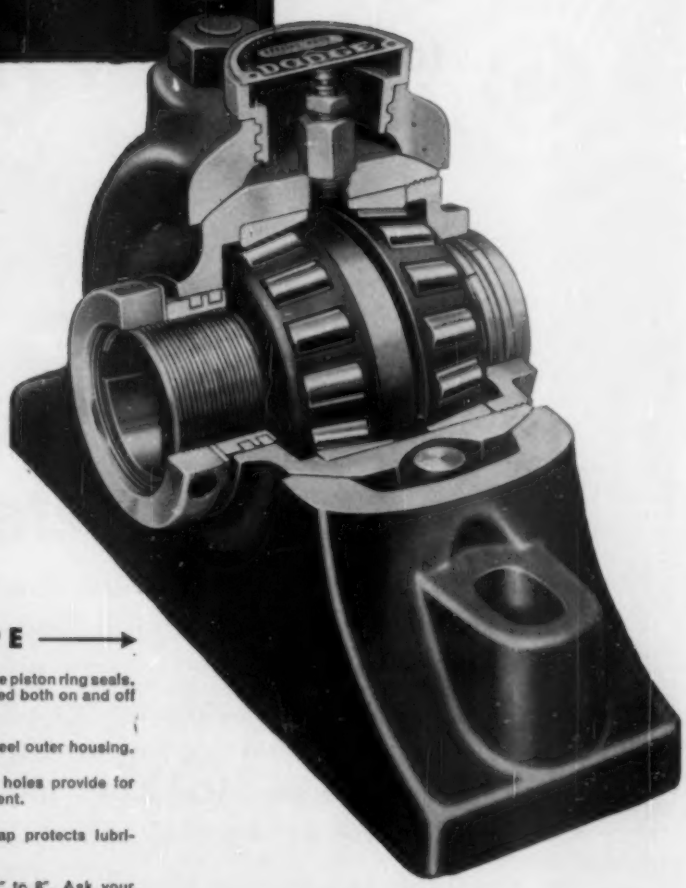
140—Heavy-Duty Electric Trucks for rough handling operations provide capacities from 15,000 to 20,000 lb. Despite capacity, truck shown is only 50 in. wide and 99 in. long, less forks. Outstanding features are its speed and maneuverability. *Elwell-Parker Electric Co.*

Turn the page

DODGE PILLOW BLOCKS

Timken Bearing Equipped

America's super-quality line—with a 34-year record of keeping performance *up* and costs *down!* Five types—to fit practically any service condition. All assembled, adjusted, lubricated and *sealed* at the factory for precision performance—long life—dependability.



SPECIAL DUTY TYPE →

- Designed for extreme precision and high load capacities.
- Fully self-aligning.
- Special Duplex Timken Roller Bearing with tapered bore.
- Split tapered sleeve with straight cylindrical bore extends through entire length of housing.
- Easy to mount or demount. Adapter nut (or collar) clamps adapter sleeve to shaft with extreme firmness.
- Automotive type piston ring seals. Bearing is sealed both on and off the shaft.
- Rugged semisteel outer housing.
- Elongated bolt holes provide for lateral adjustment.
- Special dust cap protects lubrication fitting.
- Shaft sizes 1⅞" to 8". Ask your local Dodge Distributor—or write us for Bulletin A670 giving complete technical data on America's most complete line of mounted bearings.

DODGE MANUFACTURING CORPORATION, 400 Union St., Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look in the *white* pages of your telephone directory for "Dodge Transmissioneer."

DODGE
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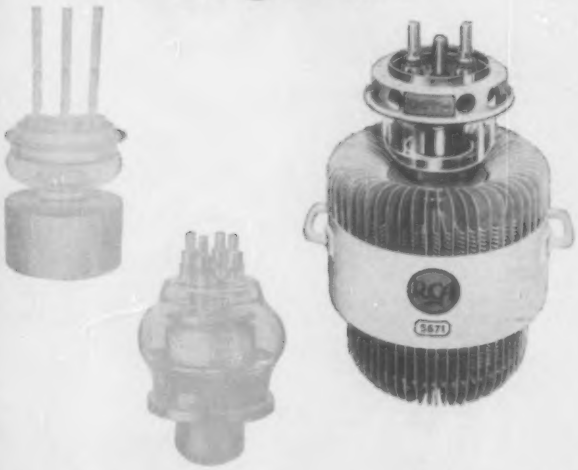
For more facts Circle 491 on Reader Service Card

RCA POWER TUBES

...for longer life



For high-efficiency electronic heating and other industrial applications involving high radio-frequency power, RCA offers an established group of Power Tubes. They are conservatively designed for long life and thus provide low tube cost per hour of operation.

Available in a wide choice of power and frequency ranges from your RCA Industrial Tube Distributor.

RCA RADIO CORPORATION OF AMERICA
Electron Tube Division Harrison, N. J.

For Free Booklet (PG-101-C) on RCA power tubes, thyratrons, rectifiers, ignitrons, magnetrons, vacuum-gauge tubes, write RCA Commercial Engineering, Section L-86-T, Harrison, New Jersey.

FACTORY / EQUIPMENT NEWS

Begins on page 62

For more about these items, circle item numbers on Reader Service Card next to back cover.

141—Zipptarp is a new tarpaulin that can be quickly altered to do many jobs. Offered in a wide choice of materials, Zipptarp consists of panels with a plastic zipper on each side. Panels are zipped and unzipped to form exact size tarp needed. *W. A. Plummer Mfg. Co.*

142—"Econo-Dox" Shelter is a low-cost (about $185) truck and rail dock shelter fabricated in standard sizes up to 11 ft. wide and 13 ft. high. Has a spring-tensioned upper frame and adjustable front head curtain; allows quick one-man operation. *Frommelt Industries.*

143—Impact Wrench Chuck is all you need to convert an impact tool to a drill. New chuck fits all ½-in.-sq. drive tools and holds ⅛- to ½-in. drills. It features a keyless gripping action, withstands shock created by impact power tools. *Supreme Products Corp.*

Turn the page

Girl stapling beats girl taping 15 to 1

This is a race between two girls in an air filter manufacturing plant.

Both girls are skilled at assembling the frames and outer screens which hold the filtrant. One girl uses tape. The other uses an electrically powered Bostitch stapler.

In the time it takes the girl taping to complete *one* filter, the girl stapling finishes 15. The result—extra profit—and a better product.

Winnings come in other ways, too. Stapled filters are neater looking and more uniform. Every staple grips securely for strength where it's needed. There's less operator fatigue, and no special operator training or skill is required.

The stapler in this race is one of more than 800 made by Bostitch to cut fastening costs in production lines, shipping rooms and offices. The staple is one of more than 200 Bostitch types.

Finding the right combination of stapler and staple to cut your costs and increase your profits is a job for the Bostitch Economy Man. Over 350 of these fastening experts are in 123 U. S. and Canadian cities.

Call in your nearest one to study your fastening methods. No obligation. He'll tell you honestly if stapling can save you money.

Look up "Bostitch" in your phone book or write us.

FREE Bulletins that tell you how stapling saves time and money for others

Fasten it better and faster with

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STAPLERS AND STAPLES

Bostitch, 612 Briggs Drive, East Greenwich, Rhode Island

I want to fasten

☐ wood ☐ plastics ☐ cartons ☐ leather
☐ rubber ☐ light metals ☐ fabric ☐ roofing

Name_____

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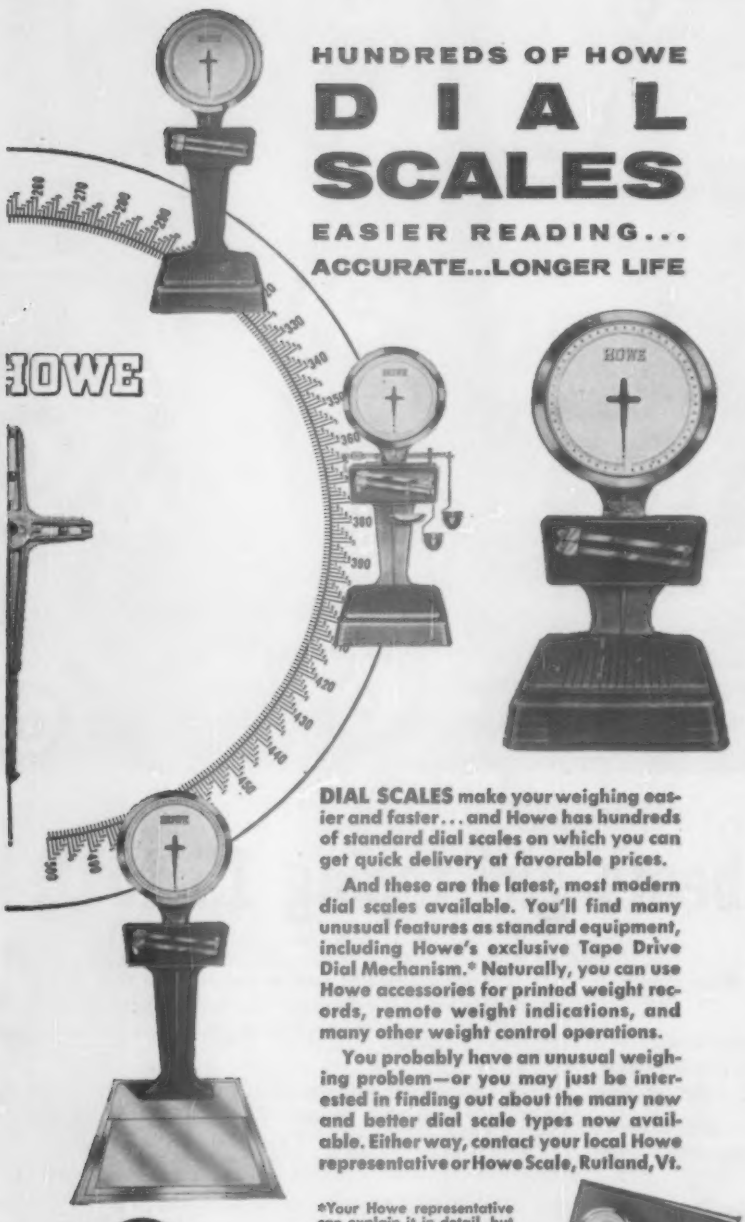

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DIAL SCALES

EASIER READING...
ACCURATE...LONGER LIFE

DIAL SCALES make your weighing easier and faster... and Howe has hundreds of standard dial scales on which you can get quick delivery at favorable prices.

And these are the latest, most modern dial scales available. You'll find many unusual features as standard equipment, including Howe's exclusive Tape Drive Dial Mechanism.* Naturally, you can use Howe accessories for printed weight records, remote weight indications, and many other weight control operations.

You probably have an unusual weighing problem—or you may just be interested in finding out about the many new and better dial scale types now available. Either way, contact your local Howe representative or Howe Scale, Rutland, Vt.

*Your Howe representative can explain it in detail, but it's a new and patented design which gives even greater accuracy, longer scale life.

NEW! DIAL SCALE CATALOG. Just out! Illustrated; gives specifications on dozens of standard and special types for industry and agriculture. Send for your free copy now!

HOWE

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FACTORY/EQUIPMENT NEWS

Begins on page 62

For more about these items, circle item numbers on Reader Service Card next to back cover.

144—Ultrasonic Generator features a separate instrument panel that allows remote control of high-volume, conveyorized production cleaning operations. Unit has 3-kw. average power output, can energize up to 6 sq. ft. of transducer area. *Branson Ultrasonic Corp.*

145—Two Hydraulic Jacks are designed to lift 50% over their 25-ton rated capacity. One model has closed height of 28 in. with a 22-in. lift; other has closed height of 22 in. with 16-in. lift. Both serve for varied lifting and pushing jobs. *Templeton, Kenly & Co.*

146—Portable Teleprinter, the same size and weight as an electric typewriter, is suited for wire communications and integrated data processing systems. The equipment punches and reads 5-channel perforated tape; handles two-color printing. *Teleautograph Corp.*

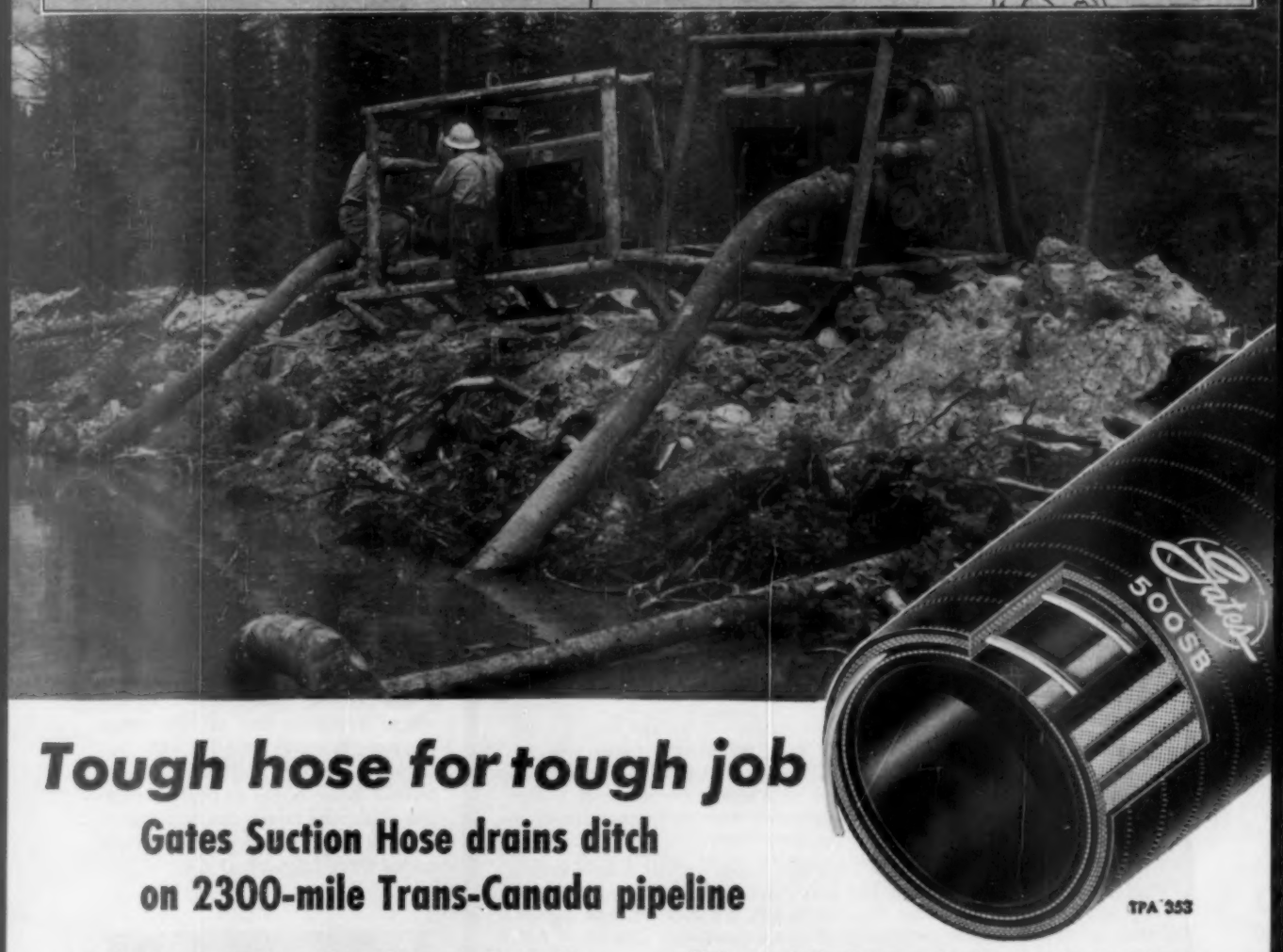
147—Solenoid Valves, available in ⅛- and ¼-in. pipe sizes, includes 2-way, 3-way, and directional valves in both normally closed and normally open types. Models are designed for air, oils, cold and hot water, gases; operation up to 600 cycles/min. *C. A. Norgren Co.*

Turn the page

For more facts Circle 493 on Reader Service Card

For more facts Circle 494 on Reader Service Card ➤

You find Gates Hose where anything flows: The 2300-mile Trans-Canada pipeline project runs through rugged country. Where water is a ditching problem, tough Gates Contractors Suction Hose is put to work getting rid of it. This pipeline will provide natural gas for some 4,250,000 customers from Montreal to Saskatchewan.



Tough hose for tough job

Gates Suction Hose drains ditch on 2300-mile Trans-Canada pipeline

Industry everywhere depends upon Gates Industrial Hose to provide air, water, steam, oil and suction for every type of application . . . including some of the toughest jobs in the world.

Tens of thousands of miles of Gates Hose are in daily use . . . every type and size from air hose the diameter of a pencil to petroleum hose as big as the mains in city streets.

Back of the world-wide acceptance of Gates Hose is a continuing program of *specialized* hose research at the multi-million dollar Gates Research Center staffed by more than 200 chemists, physicists, engineers and technicians.

This *specialized* research aims to increase hose utility and life . . . and to lower industry's annual hose costs.

Because Gates Hose is so widely preferred, it is quickly available from leading distributors in all industrial centers in the United States and in 90 countries throughout the world . . . and its performance is guaranteed by the

World's Largest Maker of V-Belts.

Gates 500SB Contractors' Suction Hose — a heavy duty water suction and discharge hose for conveying large volumes of water in trench and sewer work. Heavy spring steel wire and multiple plies make it virtually crush proof. This rugged hose, one of the wide variety of industrial hoses made by Gates, is readily available from your nearby Gates distributor.

The Mark of *Specialized* Research — Gates — **The Gates Rubber Company • Denver, Colorado**

Gates Industrial Hose

Made in a Full Range of Types and Sizes

New PAYLOADER attachment

CUTS handling COSTS in HALF

Sonken-Galamba Corp., Kansas City, Kan., produces specification ingots using scrap aluminum that arrives via rail and truck. Unloading, stockpiling, and feeding this tangled scrap to furnaces was slow, laborious and expensive until they got a model HA "PAYLOADER" tractor-shovel with hydraulic grab attachment.

"Our unloading efficiency is now substantially greater" says Robert Ryan, Sonken-Galamba executive. *"With the grab it takes only 10 to 14 manhours to unload a trailer of aluminum clippings against the former 36 hours. The efficiency of loading the material to the furnaces is also increased. We are pleased with the increased output through the use of this unit."*

This model HA "PAYLOADER" tractor-shovel has a load-carrying capacity of 1,500 lbs. with the grab, and 2,000 lbs. with regular bucket. Other useful model HA attachments are fork lift, tine bucket, pick-up floor sweeper and castered dump hoppers. Operating features include exclusive one-lever bucket control, two speeds each direction, torque converter, and rollback, breakout bucket action.

Your Hough Distributor wants to demonstrate what a model HA or larger "PAYLOADER" can do for you. Ask him about Hough Purchase and Lease Plans too. The Frank G. Hough Co., 755 Sunnyside Ave., Libertyville, Ill.

PAYLOADER®

MANUFACTURED BY

THE FRANK G. HOUGH CO. LIBERTYVILLE, ILL.

SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY 1-A-4

Send full PAYLOADER® data on

- ☐ Model HA Scrap Grab (1,500 lbs. capacity)
- ☐ Model HAH Scrap Grab (2,250 lbs. capacity)
- ☐ Larger PAYLOADER sizes (to 9,000 lbs. bucket cap.)

Name

Title

Company

Street

City

State

1-A-4 F

FACTORY / EQUIPMENT NEWS

Begins on page 62

For more about these items, circle item numbers on Reader Service Card next to back cover.

148—Air-Powered Staplers combine air return and high-speed piston features for fast, sure action. Jet-driven air return avoids production line delays; high-speed nylon piston drives staples without recoil. Staplers take wide and narrow crown staples. *Paslode Co.*

149—Fusible Load Center equipment, available for all 100-amp. service, replaces nearly 100 assembled devices with just three basic boxes. Basic boxes fit flush in shallow walls; the boxes can be roughed in, with interiors and plug-in devices added later. *Square D Co.*

150—"Load Jockey" is a compact power attachment for propelling portable elevating trucks and similar wheeled devices. Unit employs an electro-hydraulic drive, has 2000-lb. capacity, is simply attached, and has many built-in safety features. *The American Pulley Co.*

Turn the page

New **Longer-Wearing** Pattern in Wire Rope Styles!

After three years of extensive field trials this, the newest of Roebling's wire ropes, is now ready to go to work for you on a service basis that will exceed that of *the wire rope you are now using*.

Roebling Herringbone* combines the best features of both regular and Lang lay rope constructions; being made up of two *pairs* of Lang lay strands and two strands of regular lay. The regular lay strands separate the two pairs of Lang lay strands. Thus, in one rope you have the superior flexibility and abrasion resistance of Lang lay and the greater structural stability of regular lay.

For the past three years, under all kinds of conditions, Herringbone has been used for general hoisting, holding and closing lines, shovel ropes, wagon scraper ropes and dragline ropes. The results have been wonderful . . . excellent flexibility, exceptional resistance to shock and abrasion, smooth, easy operation around drums and over sheaves, smooth spooling properties and structural stability unequalled by other rope for the same job.

There has never been a better time—or a wider need—for a wire rope that returns so much service for its cost. And, in addition to being a top performer on the job, Herringbone eliminates the necessity of stocking Lang lay for one purpose and regular lay for another.

You are invited to get in touch with your Roebling distributor or write Wire Rope Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey, for further and fuller details on the *investment* qualities of this new and highly serviceable rope.

*Reg. appl. for

ROEBLING

Branch Offices in Principal Cities • Subsidiary of The Colorado Fuel and Iron Corporation

For more facts Circle 496 on Reader Service Card

Picture of worker saving money

He's helping cut waste 20% with Steiner roll towels

Paper towel expenses getting high? You can cut towel waste with a Steiner controlled roll paper towel dispenser. Here's how: User pulls from the cabinet only the amount of toweling he needs . . . no grabbing of a handful of towels that aren't needed, half used and then discarded. Still, user gets plenty of towels for thorough drying job. You can save 20% or more in towel costs with Steiner controlled dispensers.

Install them on a trial basis and see how you save. For more information contact your janitorial supplier or sanitary paper distributor or write Steiner Company, 740 Rush Street, Chicago 11, Illinois.

STEINER

STEINER COMPANY

740 RUSH STREET, CHICAGO 11, ILL., DEPT 12-B

Please send me free bulletins on Steiner controlled roll paper towel dispensers.

NAME_____

COMPANY_____

STREET_____

CITY_____ ZONE____ STATE_____

FACTORY / EQUIPMENT NEWS

Begins on page 62

For more about these items, circle item numbers on Reader Service Card next to back cover.

151—Air-Powered Brad Gun is a low-pressure, high-power woodworking tool that will drive brads four times faster than hand methods. It holds 100 cohered brads, drives 1- and 1¼-in. brads into hard materials at pressures low as 50 lb. It weighs 5 lb. *Fastener Corp.*

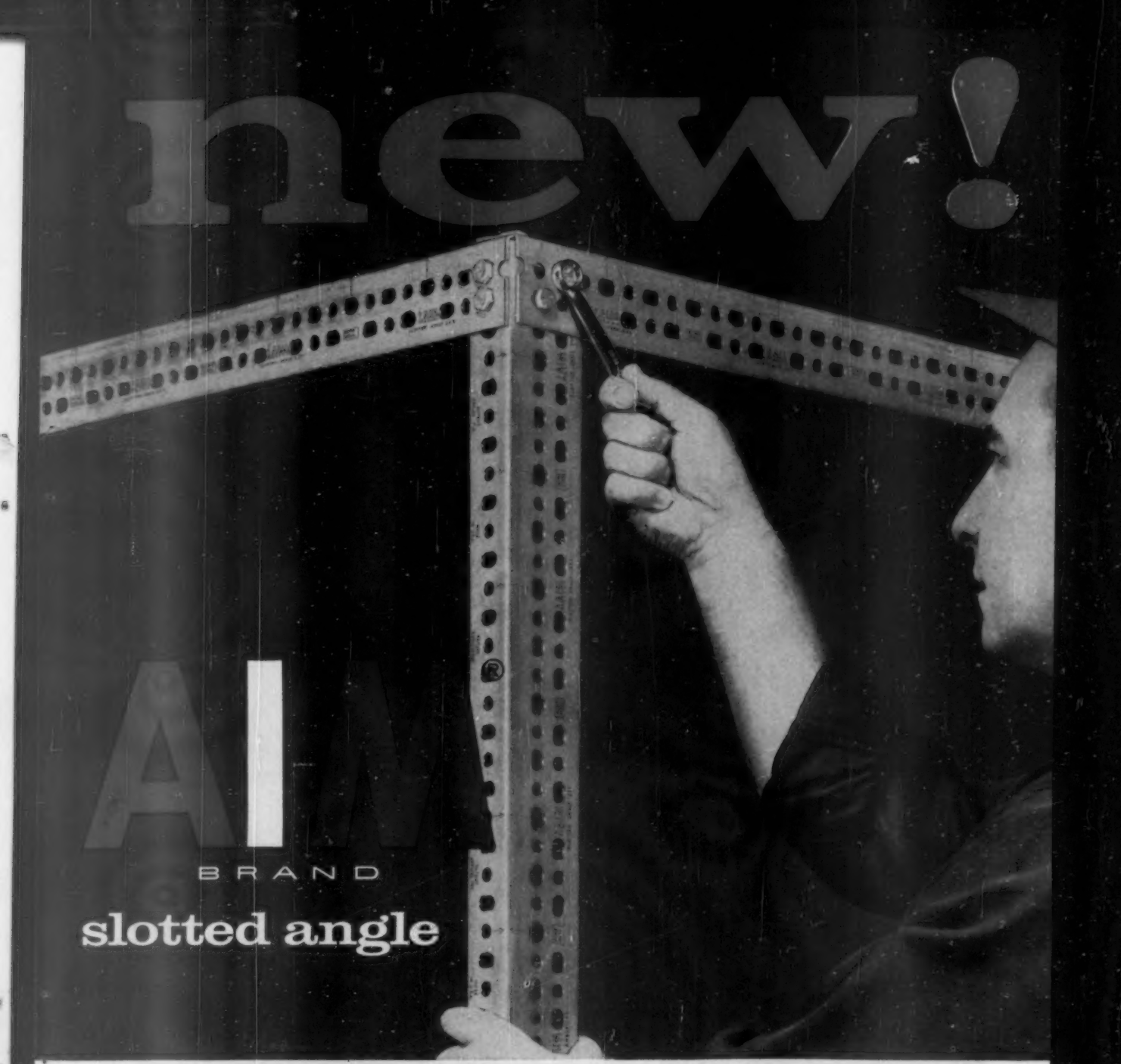
152—Hydro-Hi Lift Unit simplifies maintenance of lighting fixtures, cleaning and painting of walls and windows, high lifting jobs in stockrooms. Unit is controlled from the 6-ft. platform, turns 360 deg. either way, and has 400-lb. capacity. *Stratton Equipment Co.*

153—Four-Wheel Drive Trucks will cruise along a highway in 2-wheel drive, or pull through deep mud, snow, or sand when shifted into 4-wheel drive. F-250 series, equipped with optional 292 (cu. in.) V-8 engine, will climb grades over 60%. *Ford Div., Ford Motor Co.*

Turn the page

For more facts Circle 497 on Reader Service Card

For more facts Circle 498 on Reader Service Card ➤



faster-framing • precision-quality • 100% reusable

This versatile new Acme Steel framing metal brings amazing ease and economy to building durable structures and equipment. Its pattern makes it ideal. Scientifically spaced slot-and-round-hole pattern simplifies assembly. Friction-Joints can be made by bolting through slots when speed and convenience are most important. For maximum strength, bolting through round holes forms a Lock-Joint that just won't budge. Structural bolts with a 2000-pound safe load capacity can be applied with a hand or power wrench. Just plan, measure, cut and bolt.

AIM Brand Slotted Angle is cold-rolled galvanized steel for dependable strength and rigidity. 10 or 12 foot lengths come in packages of 10 pieces with bolts and nuts. Available in two sizes: Standard 225-80 (2¼" x 1½" x .080") and Heavy-duty 300-104 (3" x 1½" x .104").

FREE! Get ideas from the AIM Brand Slotted Angle brochure for fixtures and equipment you can build with less material, fewer man-hours. Write Dept. FAD-128, Fabricated Materials Division, Acme Steel Company, Chicago 27, Ill.

ACME STEEL **AIM Brand Slotted Angle** AIM BRAND

can be just as important to you!

Your life line . . . the single thing that keeps your plant operating at a profit . . . is efficient and continuous production. Your profits, employee morale, plant-community relations . . . all can be seriously threatened by inadequate dust or fume control.

KIRK & BLUM, for over 50 years, have been specialists in designing, fabricating and installing dust and fume control systems. From the time engineers arrive to consult, to the moment skilled erectors leave . . . your work is in the hands of one experienced, reliable organization.

Write The Kirk & Blum Mfg. Co., 3209 Forrer Street, Cincinnati 9, Ohio.

FOR CLEAN AIR . . . THE INVISIBLE TOOL

KIRK AND BLUM

DUST AND FUME CONTROL

FACTORY / EQUIPMENT NEWS

Begins on page 62

For more about these items, circle item numbers on Reader Service Card next to back cover.

154—Electromechanical Car Shaker, with 4-hp. self-lubricating motor, produces 850 powerful vibrations per min. to empty railroad hopper cars in a hurry. Device, mounted on hook-type steel frame, is easily attached to car; eliminates rodding and poking. *Syntron Co.*

155—"Monoruler" Line-Up Table uses only a single horizontal straight edge for both horizontal and vertical markings in conjunction with the built-in "Square-A-Matic" registration system. Price of this 31-in.-sq. work area table is under $600. *Joseph Gelb Co.*

156—Thermatron Instrument provides accurate control of furnace atmospheres and determines gas purity. Combines the thermal conductivity and convection qualities of a gas to selectively analyze one component in a multi-component gas mixture. *Mine Safety Appliances Co.*

Turn the page

Is your business moving at 3 miles an hour?

A man walks about 3 miles an hour.

But his voice travels via telephone at the speed of light.

How many people in *your* place would save time and money by contacting each other at 186,000 miles per second?

Top firms in all industries have speeded up operations and pocketed sizable savings with P-A-X—the "inside" business telephone system.

P-A-X is privately owned — entirely independent of public (outside) phone service. It sharply cuts the cost of rented equipment. It's 100% automatic—requires no operator. It gives you "split-second" handling of inside calls—keeps the regular switchboard free for important incoming and outgoing calls.

Saves man-hours—saves manpower

P-A-X interconnects all departments with dial telephone service — ends employees' needless effort and wasted time in contacting each other. It prevents tie-ups, speeds the relay of information and instructions.

Get full information on this proved way to step up efficiency and trim costs. Send coupon for case history studies that give facts and figures on P-A-X installations in business similar to yours. Do it now.

Automatic Electric Sales Corporation
Northlake, Illinois

☐ *Send me information on P-A-X*
☐ *Have your representative call*

Name _____ Title _____

Company _____

Type of Business _____

Address _____

AUTOMATIC ELECTRIC

For more facts Circle 500 on Reader Service Card

Get the Advantages of READY-POWER on Your Electric Industrial Trucks

Get Live Power for Walkie Trucks

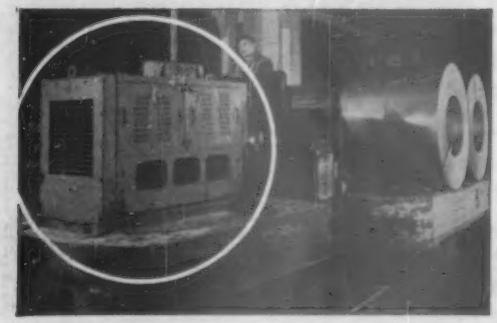
Ready-Power's popular bantam model "W" is equipped with dependable 12-volt automotive-type starting and ignition. Variety of idling speeds and easy accessibility make it ideal for all walkie trucks as well as rider trucks up to 2,000 lbs.

Work Your Fork, Platform, Tractor Trucks 'Round the Clock

Ready-Power gas-electric and LPG-electric units give materials handling trucks continuous, full power all the time. Slowdowns due to power fatigue are eliminated. The simple, all-electric control and live response make Ready-Power-equipped trucks rate high with truck operators.

Energize Lift Magnets on Your Electric Trucks

In the application shown at the left, the Ready-Power unit not only powers the truck, but also energizes the lift magnet for handling scrap metal. Ready-Power units are removable for shop adjustment while a spare keeps trucks working.



Get Diesel Electric for Lowest Ton-Mile Costs

Take a tip from the owners of industry's biggest trucks . . . power them with Ready-Power diesel-electric for maximum stamina, dependability, and lowest operating costs. Ready-Power offers power for every size and make of electric truck.

Your Truck is No Better than its Power . . . Write for Information on Ready-Power gas-electric, LPG-electric, and Diesel-electric Units

READY-POWER

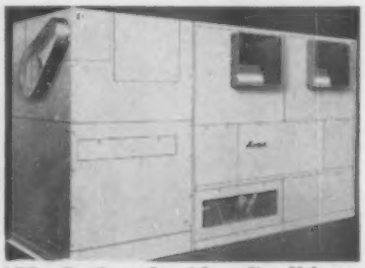
The READY-POWER Co., 3820 GRAND RIVER AVE., DETROIT 8, MICH.

Manufacturers of Gas and Diesel Engine-Driven Generators and Air Conditioning Units; Gas and Diesel-Electric Power Units for Industrial Trucks

FACTORY / EQUIPMENT NEWS

Begins on page 62

For more about these items, circle item numbers on Reader Service Card next to back cover.



157—Packaged Air Conditioner (PAC Model) is a factory-assembled unit designed to provide cooled, dehumidified, and filtered air for plant buildings. Installation requires only connection of power, water supply, and drain. Capacities: 20-60 tons. *Acme Industries, Inc.*

158—Air-Powered Pump dispenses unpigmented paints, primers, lacquers direct from 2-in. end bung of original shipping drums. This lightweight (17½ lb.) pump dispenses up to 120 gph. for circulating paint system operation, feeds up to five spray guns. *Gray Co., Inc.*

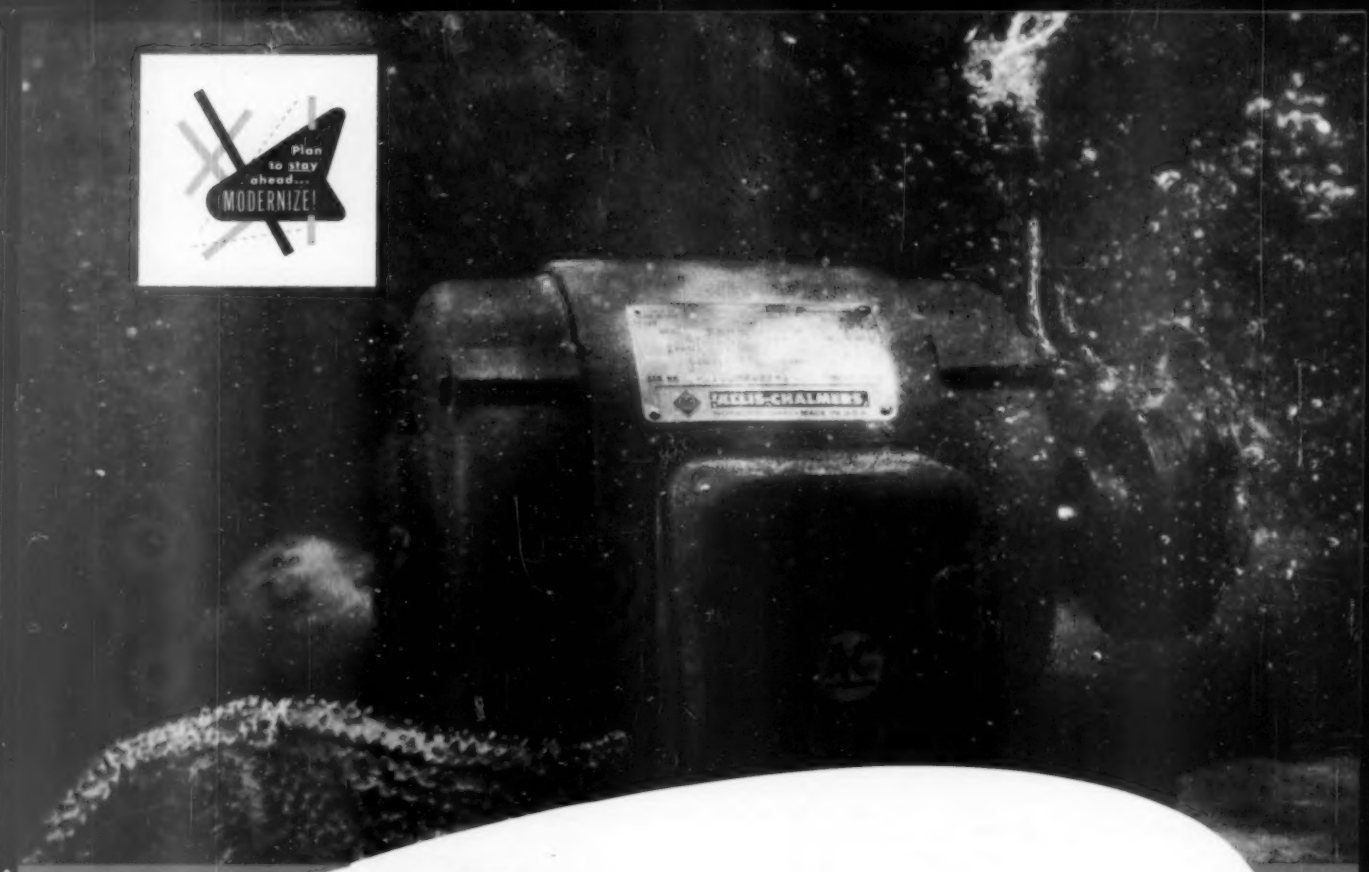
159—Production Recorder provides a ready count of the number of units produced during any preselected time interval. This digital demand recorder produces a permanent record on punched paper tape, for use with automatic data processing machines. *Fischer & Porter Co.*

160—Radio Pocket-Paging system, all-electronic, is handy for instantly contacting key personnel around the plant. System handles selective paging of an unlimited number of people within plant area, without annoying bells, lights, p-a calls. *Hanak Engineering Co.*

Turn to page 89

For more facts Circle 501 on Reader Service Card

For more facts Circle 502 on Reader Service Card ▶



New motor development obsoletes today's application practices!

Only from Allis-Chalmers!

Super-Seal motors save up to 60%

Here's an amazing advance in motor technology! It's the *Super-Seal* motor line—an open motor design so completely unaffected by moisture, dust, dirt, oil, acids and alkalies that it can be used in many applications previously requiring more costly enclosed motors. *Savings range from 15 to 60%.*

Super-Seal motor superiority results from two distinct revolutionary insulating techniques. Available in any integral horsepower size, smaller *Super-Seal* motors incorporate a *Poxeal* stator. A durable epoxy resin encloses the stator, creating an electrical system impervious to outside elements.

In larger sizes, *Silco-Flex* insulation is used. In this system, silicone rubber is vulcanized into a homogeneous mass to form a flexible, moisture and heat resistant, void-free dielectric barrier around coils and leads.

Both of these insulation systems are unsurpassed. Proof? An encapsulated motor ran for hundreds of hours at full load in a 4% brine solution.

Find out more by reading the next pages; then contact your A-C representative or distributor, or write Allis-Chalmers at address shown on back page.

A-C **ALLIS-CHALMERS**

51B 9100

Two revolutionary insulating techniques developed and pioneered by Allis-Chalmers mean savings of millions of dollars for motor users . . .

New open motors are unaffected by moisture and contaminants

Modern insulating materials and new methods of application, now available in *Super-Seal* open-type motors, are drastically changing motor application standards. These insulations are so completely impervious to moisture and contaminants that *Super-Seal* open motors can be used in most applications formerly requiring costly enclosed designs. Existing applications have resulted in savings as high as 60% .

Basic insulation systems

Larger *Super-Seal* motors with form-wound stator coils use the *Silco-Flex* insulation system. Heart of this system is a remarkable rubber-like silicone elastomer, applied in semi-cured state and vulcanized to form a void-free, impervious dielectric barrier. More than four years of development and field testing have proven the superior electrical and physical properties of *Silco-Flex* insulation systems.

Stator coils of smaller random-wound motors are protected by equally effective *Poxeal* insulation system. A tough, durable case of epoxy resin completely seals the winding end turns and slot portions. Bonded to the stator laminations, it forms a seal completely impervious to contaminants.

Moisture resistance

In addition to being void-free, the silicone elastomer used in *Silco-Flex* insulation is moisture repellent. Even in high humidity, moisture does not form a surface film of condensation. Coils with this protection can operate completely immersed in water. In fact, one of the recommended cleaning procedures is use of detergent and water.

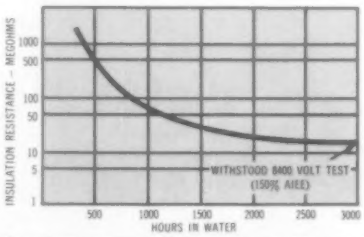


Fig. 1—Test curve shows insulation resistance of *Silco-Flex* insulation while immersed in water.

Moisture resistance of *Silco-Flex* coils is demonstrated in Fig. 1. After more than 3000 hours of total immersion with 2300 volts impressed on the coil, the test was terminated when it became apparent that little more drop could be expected in the coil's insulation resistance. At that point the coil still withstood a high potential test of 8400 volts without injury.

Encapsulated stator windings are equally well sealed. Motors with *Poxeal* insulation protection have been thoroughly tested under water while operating with full load and full voltage.

Resistance to contaminants

Silicone elastomers and epoxy resins are relatively inert to attack by practically all reactive agents. Further, the void-free construction of insulation systems used in *Super-Seal* motors prevents penetration of contaminants. As a result, *Super-Seal* motors are unaffected by oils, most acids, salt solutions, alkalies, and oils and are ideally suited for such applications.

Thermal stability

Temperature-wise, *Silco-Flex* insulation can easily withstand hot-spot temperatures of 200 C and more—

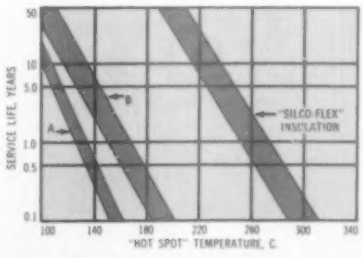


Fig. 2—Chart shows that *Silco-Flex* insulation more than meets Class H requirements.

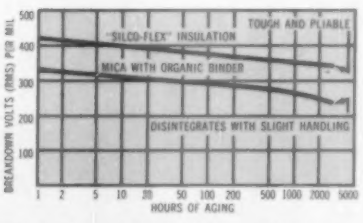
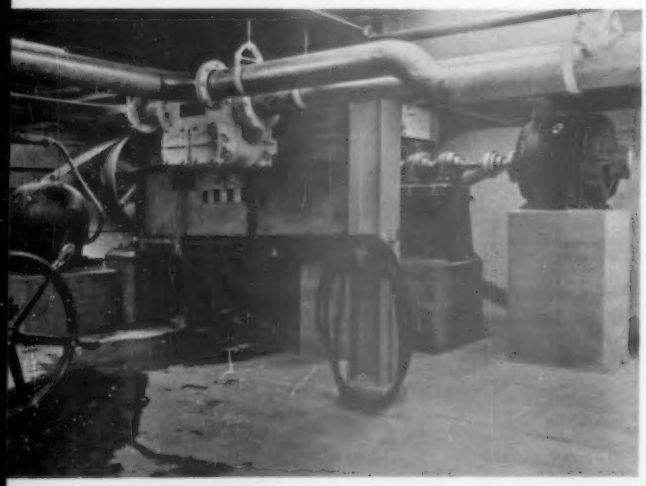


Fig. 3—Tests of 2300-volt insulated bars show thermal stability of *Silco-Flex* insulation.



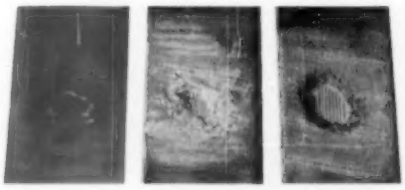
Paper mills have wide application for *Super-Seal* motors because of moist atmospheres.

easily meeting Class H temperature requirements (Fig. 2). At temperatures where the life of Class B coils would be measured in weeks, the life span of *Silco-Flex* coils is well beyond machine obsolescence.

Comparison with a mica-organic binder insulating system (Fig. 3) offers further proof of thermal stability. After 2000 hours of aging at 200 C with 8500 volts applied continuously, the *Silco-Flex* insulated coil was still tough, pliable, and completely serviceable. The mica-taped insulation had deteriorated to the point where it disintegrated readily and was completely useless.

An added advantage of *Silco-Flex* insulation is unusually high thermal conductivity — about twice that of conventional insulations. This means heat dissipates faster from its point of generation.

Poxeal insulation also demonstrates remarkably good thermal stability. Materials now in use are suitable for Class B temperatures, although actual classification of the insulation is determined by the basic material used.



Silco-Flex Insulation | Polyester Mica Tape | Asphaltum Mica Tape

Fig. 4—Samples of motor insulations after sandblasting give comparison of abrasion resistance.

Abrasion resistance

Resistance to abrasion is still another point of superiority in the insulation systems used for *Super-Seal* motors. Abrasion resistance of *Silco-Flex* insulation is compared to other types of insulation in Fig. 4. After one minute of sandblasting with 90-grit aluminum oxide and 100-psi air, only slight surface erosion appeared on the *Silco-Flex* sample. Other insulations were eroded to bare copper.

Application practices obsolete

The superior qualities of *Super-Seal* insulating systems, developed by Allis-Chalmers, make it necessary to reappraise present application practices. With virtually ageless insulation, *Super-Seal* motors assure more reliable service and require less upkeep than the best protected, conventionally insulated machines — and at considerably less cost.

Super-Seal, Poxeal, and Silco-Flex are Allis-Chalmers trademarks.

CHRYSLER KIMBERLY-CLARK GOODYEAR SOUTHERN CEMENT CONTINENTAL CAN AMERICAN OIL CELOTEX SCOTT PAPER HURON PORTLAND CEMENT FORD FIRESTONE PACIFIC GAS & ELECTRIC STANDARD OIL OF INDIANA B. F. GOODRICH DOW CHEMICAL MARLEY INGERSOLL-RAND LINK-BELT

WIDE ACCEPTANCE

of Super-Seal motors proves their advantages

Cement, petroleum, chemical, steel, mining, paper, utilities, municipalities and general industry — outstanding corporations in every field are specifying *Super-Seal* motors wherever operating conditions are tough.

Cost and *superior insulation* aren't the only reasons. Users are getting MORE MOTOR, too. Here's why:

Standard totally-enclosed motors, 55° C rise, have a *service factor of 1.* In other words, "nameplate" horsepower is the maximum. A 40° C rise *Super-Seal* motor with *Poxeal* insulation, and a 60° C rise *Super-Seal* motor with *Silco-Flex* insulation have a *service factor of 1.15.* For comparisons on what this difference means in required motor sizes, see this chart:

Rated Horsepower (Maximum Hp, TEFC)	Maximum Continuous Hp—Super-Seal Motor
15 hp	17.25 hp
25	28.75
40	46
75	86.25
125	143.75
200	230
350	402.5
500	575

Join the swing to *Super-Seal* motors. It will pay dividends fast. Contact your A-C representative or distributor, or write Allis-Chalmers at address shown on back page.

ALLIS-CHALMERS

SOUTHERN CALIFORNIA EDISON LONG ISLAND LIGHTING AVCO UNION BAG UNIVERSAL ATLAS UNION CARBIDE OHIO OIL INTERNATIONAL PAPER SOUTHERN PACIFIC PIPE LINE ALCOA ROHM & HAAS ARMOUR SHELL OIL COMMONWEALTH EDISON OWENS-ILLINOIS WYANDOTTE CHEMICAL BETHLEHEM STEEL ALLEGHENY-LUDLUM MEAD DU PONT DETROIT EDISON ESSO HERCULES POWDER SINCLAIR PIPE LINE GENERAL TIRE MONSANTO

This *SUPER-SEAL* MOTOR application SAVED $3000!

Find out how much you can save

This application of a *Super-Seal* open-type motor — in place of a weather-protected design of the same rating — *saved the user $3000.00!*

You can achieve similar savings! Fill out the data sheet below and *find out for yourself how much you can save — on a "no-strings-attached" basis.*

Here's what to do: 1) Select an enclosed motor application in your operations (a new motor need or, for comparison, a motor just purchased); 2) fill out the data sheet; 3) mail to the address shown.

We'll give you a cost quotation on a *Super-Seal* open motor for that application.

Fill out this data sheet—

no strings attached—to find out how much you can save on a new motor or on an existing motor installation

To: **ALLIS-CHALMERS**
888 S. 70th St., Milwaukee 1, Wis.

Motor Data

1. Type (i.e., squirrel cage):

Horizontal ☐ Vertical ☐

Hp..... Rpm.....

2. Phase..... Frequency.....

Voltage.....

3. (For synchronous only)

Power factor.....

Starting torque.....

Pull-in torque.....

Pull-out torque.....

Application Data

4. Description of application:

5. Drive: Direct-connected ☐

V-Belt ☐ Other:.....

Starting load.....

Ambient temperature.....

6. Operating conditions:.....

Dirty ☐ Clean ☐ Wet ☐ Dry ☐

Other.....

Information on Existing Motors
(for comparison)

7. Type of insulation

Type of enclosure

Time rating.....

Temperature rise.....

Bearings:

Anti-friction ☐ Sleeve ☐

8. Special characteristics or construction:

NAME.....

TITLE.....

COMPANY.....

ADDRESS.....

A-5869

ALLIS-CHALMERS

FACTORY / EQUIPMENT NEWS

Begins on page 62

For more about these items, circle item numbers on Reader Service Card next to back cover.

161—Protective Pads are for use on wire rope slings when lifting heavy machines and parts by crane. Pads are mounted on rope and slid to points where the sliding wire rope would scratch or damage the load. Pads come in five sizes, two styles. *Columbia Technical Corp.*

162—Substation Transformers, in standardized design core-form, are offered in all ASA standard ratings, 750 to 10,000 kva., 3 phase, 69 kv. and below. Streamlined look and lower maintenance result through use of internal tank bracing. *Westinghouse Electric Corp.*

163—Desk and Drawing Board Combo unit looks like ideal work center for engineers. All-steel, L-shaped unit provides 27 sq. ft. of work surface, puts drawing board within a short idea's distance of the creative man at the desk. *Standard Pressed Steel Co.*

Turn the page

RESOLITE FIBERGLASS PANES
stop recurring and costly window pane replacement!

They're shatterproof—and better for interior daylighting, too, because of their greater horizontal light diffusion.

Once you replace your glass lights with Resolite *shatterproof* fiberglass panes, you'll have glazing that will last virtually as long as the sash.

The cost of the panes is only a fraction of the maintenance cost. Replacement labor is the biggest item. Resolite panes pay for themselves many times over—and quickly, too! Daylighting color choice as desired.

FIRE RETARDANT PANES

In addition to the standard Resolite polyester resin formulation, where desired, panes are supplied in the famous **FIRE-SNUF®** formulation, which is Underwriters' Laboratories labeled and Factory Mutual approved.

Clip and mail this coupon for complete information, specifications and installation details.

RESOLITE CORPORATION ZELIENOPLE, PA.

Chicago • Atlanta • Houston • Toronto

Resolite Corporation
Zelienople, Pa.

Please send me, without obligation, Bulletin 586, with complete information about factory glazing with Resolite fiberglass panes.

Name.....

Company.....

Address.....

City.....Zone.....State.....

FMM

USE COLSON TRUCKS

DRUM TRUCKS Here's the fastest, safest, most efficient way to handle drums and barrels. Locks firmly on any size container.

HAND TRUCKS Over 50 types for easy, one-man handling of bags, cases, drums or crates up to 1000 pounds.

TO MOVE MATERIALS

TRAY TRUCKS Over 200 types and sizes. Tray, dish, package and rack-types to speed transfer of food or merchandise.

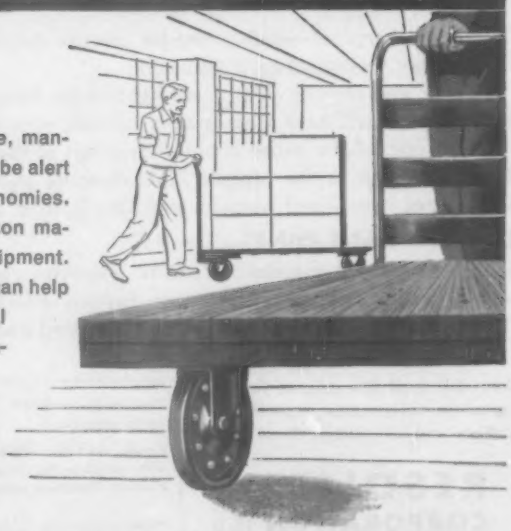
PLATFORM TRUCKS Over 100 types and sizes. Smooth-rolling wood or steel bodies. Handle, stake, or flat-bed types for loads up to 2400 lbs.

TO SAVE MANPOWER

LIFT JACK SYSTEMS Positive locking mechanism. The connecting pin on the jack is guided surely to the skid socket with ease, even in the dark.

IN-LINE TRUCKS They roll and maneuver swiftly . . . save time and manpower . . . cut costs tremendously . . . withstand years of rugged service.

AND SAVE MONEY



To remain competitive, management must always be alert to new operating economies. One way is with Colson materials handling equipment. Find out how Colson can help you, contact your local representative or distributor or write to:

Colson

The Colson Corporation
JONESBORO, ARKANSAS

A Subsidiary of Great American Industries, Inc.—Elyria, Ohio
Plants in: Jonesboro, Ark., Elyria, Ohio, Somerville, Mass., and Toronto, Can.

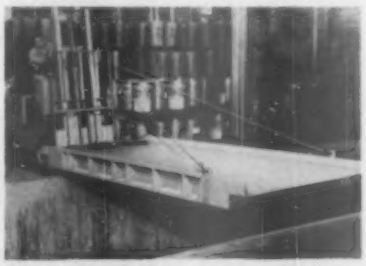
FACTORY / EQUIPMENT NEWS

Begins on page 62

For more about these items, circle item numbers on Reader Service Card next to back cover.

164—Flexible Shelving Units readily adapt to your needs: they double-rack, attach in long rows, may be moved from place to place. Shelves have snaps that simplify adding extra shelves. Units are built 84 in. high; 36 in. wide; 12, 18, or 24 in. deep. *Frontier Mfg. Co.*

165—Motor Control Center's design cuts in-plant time needed to change individual control units. Basic structure is 90 in. high, holds 5 to 8 modular units whose dimensions permit intermixing units to meet needs of varied processes. *Continental Electric Equipment Co.*



166—Removable Bridges of lightweight magnesium serve to connect plant and warehouse buildings. They don't require power operation, can be installed without altering existing docks or floors. Lengths to 24 ft., widths to 70 in., capacities to 8 tons. *Magline, Inc.*

167—Heavy-Duty Hydraulic Lift, the Gerlinger 40-SH material carrier, has a lifting and carrying capacity of 40,000 lb.; and features power steering, hydraulic brakes. Unit's hydraulic lifting shoe can be swung in or out at any lifting position. *Towmotor Corp.*

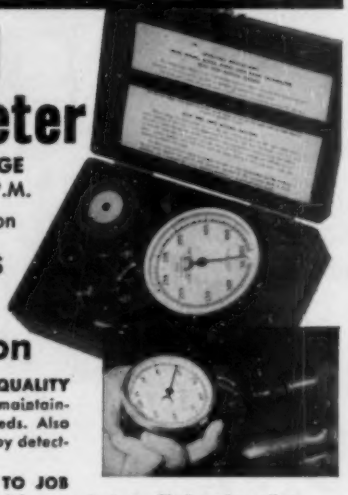
Turn the page

JONES #3200

Hand Tachometer

BROAD RANGE
50 — 5,000 R.P.M.
with stop button

assures better production



HIGHER OUTPUT — QUALITY CONTROL obtained by maintaining proper machine speeds. Also helps avoid breakdowns by detecting irregularities.

CARRY IT FROM JOB TO JOB and keep it handy for quick, accurate tests. Choice of readings in R.P.M., F.P.M., etc.

GUARANTEED ACCURACY—superior construction, trouble-free. Unaffected by moisture, temperatures, electric currents.

Many other Portable and Stationary Models, indicating Speeds between 50 R.P.M. and 50,000 R.P.M., are available.

Write for catalog 148-H

JONES MOTROLA CORP.
Stamford, Conn.

For more facts Circle 505 on Reader Service Card

DUSTKOP "520"

designed to collect dust from single machines

portable— easily installed

DUSTKOP STOPS DUST

Self-contained Dustkop models, like the "520," are practical and effective in collecting dust from single machines. They're designed specifically for service with surface grinders, tool and cutter grinders, offhand grinders, buffers and other small wheel equipment. These units are also easy to install — are actually portable — and very economical to operate.

Write for illustrated literature
46 models to choose from!

NEW DUSTKOP AUTO SHAKER shakes filters AUTOMATICALLY

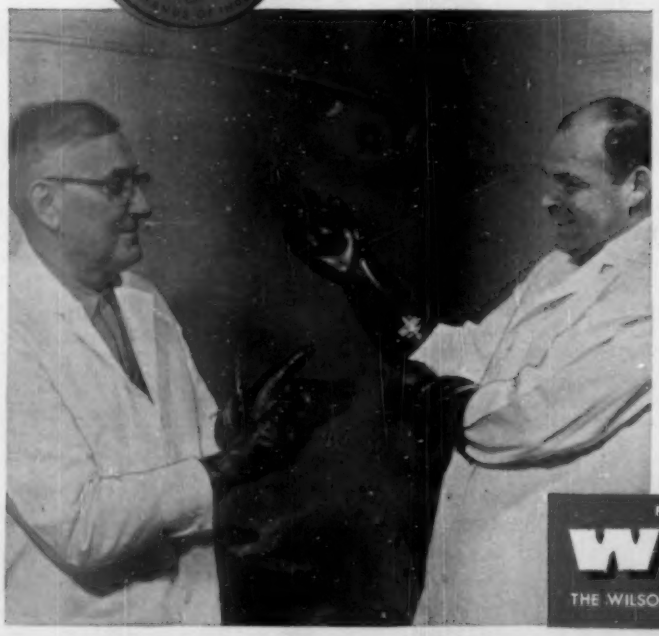
AGET manufacturing company
1410 E. Church Street, Adrian, Michigan

ask for details

For more facts Circle 506 on Reader Service Card

WIL-GARD

Why Balanced-Formula Neoprene ASSURES BETTER HAND PROTECTION



It's possible to make a Neoprene glove as tough as a rhinoceros skin or as soft as silk . . . but only at the expense of vital protective features. Wil-Gard's new Balanced-Formula Process keeps all the essential safety features in balance—toughness and durability . . . stay-on comfort and flexibility . . . better resistance to scores of industrial solutions and solvents. For sizes and styles, see your Wil-Gard Distributor, or write for latest catalog.

Now • 9 quality lines • 1 dependable source

NATURAL RUBBER • LATEX • SOFT-LINED LATEX
BLACK NEOPRENE • WHITE NEOPRENE
SOFT-LINED NEOPRENE • BUNA-N
COMPAR PLASTIC • LINEMEN'S NATURAL RUBBER

Sold only through Distributors

WR-158-27B

PROTECTION FOR THE HANDS OF INDUSTRY • SINCE 1916

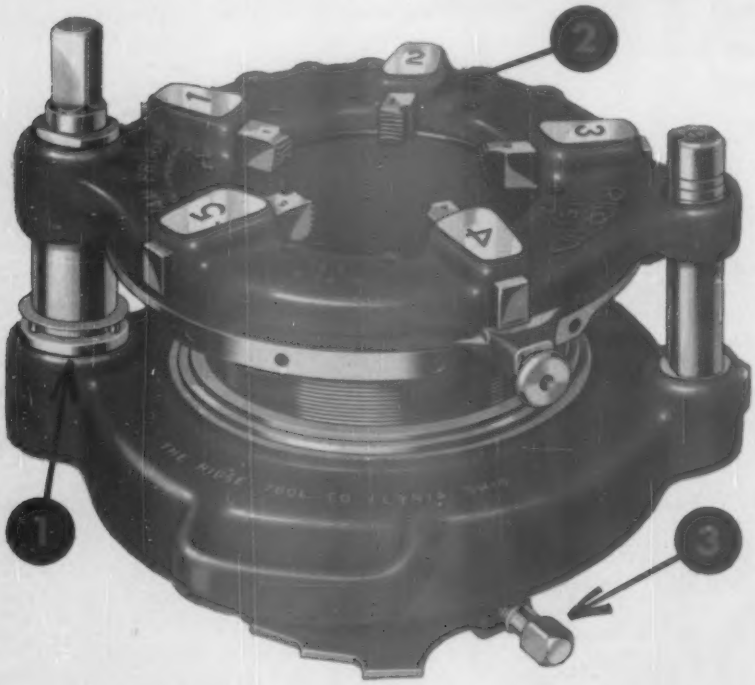
WIL-GARD

THE WILSON RUBBER COMPANY • INDUSTRIAL DIVISION • CANTON 6, OHIO
A Division of Becton, Dickinson and Company

For more facts Circle 507 on Reader Service Card

Now you thread 4", 4½", 5" and 6" pipe with only One set of dies with the New RIDGID

No. 161 4" to 6" Geared Pipe Threader



Check These Time-Saving Features:

1. Jam-Proof for safe threading by power or hand. Drive pinion kicks out automatically when full thread is cut. Die head can't jam.

2. Only 1 Set of High Speed Dies threads 4", 4½", 5" and 6" pipe. 2 quick release knobs for fast size settings. Adjustable for tapered or straight, over or under size threads.

3. Plate Type Workholder sets to size *before* putting on pipe. Just one screw to tighten—no bushings.

What's more the new No. 161 has all the time-saving and proved performance features that have made the RIDGID 65R-TC and 4PJ Threaders the world's most popular. Save time on your large pipe jobs . . . order the 161 from your Supply House today!

The Ridge Tool Company, Elyria, Ohio, U.S.A.

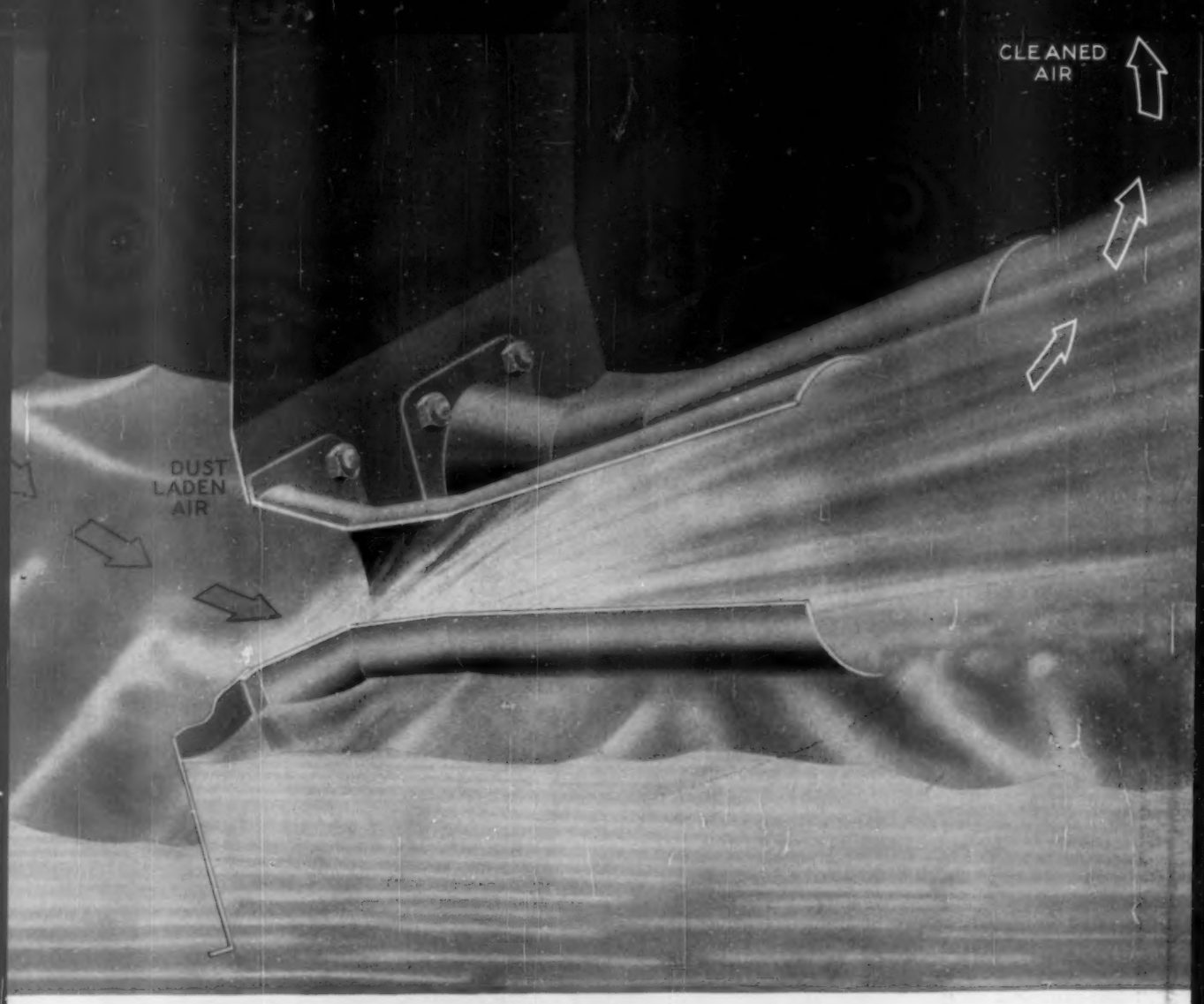
For more about these items, circle item numbers on Reader Service Card next to back cover.

168—Low-Cost Air-Operated Drive called "Impactogear" operates large, high-pressure valves quickly and easily—enables one man to open or run large valves, instead of a crew. Unit offers a big advantage in process plants with limited personnel. *Edward Valves, Inc.*

169—Thermo-Drive Actuator uses the expansive force of Freon vapor to position valves with high accuracy. Device uses no electrical contacts. It develops a force of 500 lb., gives a total stroke length of 1.5 in., and a response speed of 0.1 in. per sec. *Swartwout Co.*

170—Two Bin Vibrators, impact and semi-noiseless models, are for bins, chutes, hoppers with walls up to $\frac{3}{16}$ in. thick, and of about 20-cu.-ft. capacity. Pin-pointed hammer-like vibration set up by the units assures steady flow of granular material. *Eriez Mfg. Co.*

Turn the page



Puts the squeeze on difficult dusts

Pangborn Ventrijet Wet Dust Collector uses exclusive venturi tubes for peak efficiency

Pangborn Ventrijet Wet Dust Collector on the job. This is just one of Pangborn's comprehensive line of wet and dry dust collectors.

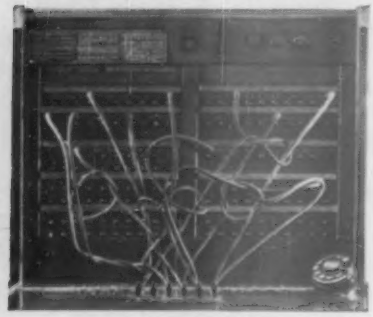
That pinch-necked venturi tube is the secret behind Pangborn Ventrijet performance. As dust-laden air flows through these tubes, the constriction creates a low-pressure area which draws water into the air stream. The resulting turbulence breaks the water into particles which actually *wash* the dust from the air. The simplicity of Ventrijet design saves money in its ease of installation, its low cost of operation and maintenance.

Although the Ventrijet is particularly suited to collecting hot, moist, inflammable, corrosive and obnoxious dusts, the Pangborn engineering it typifies is important to *any* dust-producing plant. It is not enough to put a dust collector within a plant. An efficient dust control system must be *scientifically* planned, designed and constructed to handle effectively a specific dust problem. This thinking is incorporated into every Pangborn proposal.

The Pangborn Engineer in your area will be glad to go to work for you. He is a dust expert *and will discuss your individual problem at no obligation. And, for more information, write for Bulletin 922 to:* Pangborn Corp., *2100 Pangborn Blvd., Hagerstown, Md. Manufacturers of Dust Control and Blast Cleaning Equipment.*

Pangborn CONTROLS DUST

YOUR COMMUNICATION PROBLEM IS INTERNAL!



...and DUKANE can solve it

Instant communication by DUKANE saves time and steps. DUKANE provides dependable intercom, private automatic telephone, paging, emergency alarm and evacuation, and background music facilities. DUKANE systems may be used separately or in combination, for complete flexibility and versatility. DUKANE'S communication systems are custom-engineered from mass-produced components—give you the most economical combination for your individual communication needs.

ONE SYSTEM...ONE MANUFACTURER...ONE RESPONSIBILITY GIVES YOU

- emergency evacuation
- time and work-break signals
- inspection control
- background music
- private telephones
- complete intercommunication

DUKANE

Find Your Nearest Distributor In The 'Yellow Pages'

DuKane Corporation, Dept. F-1285
St. Charles, Illinois

Send me information on DuKane systems for better business management.

Name_____

Company_____

Address_____

City & State_____

DuKane sound systems are installed and serviced by a Coast-to-Coast network of more than 300 engineering distributors

FACTORY / EQUIPMENT NEWS

Begins on page 62

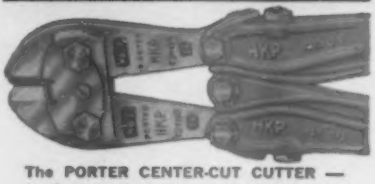
For more about these items, circle item numbers on Reader Service Card next to back cover.

171—Respirator protects workers against intense heat in areas such as kilns and ovens where temperatures range up to 300 F. The lightweight (6 oz.) device works simply, effectively: worker breathes in and heat is stored in cartridge; he breathes out and heat is forced out. *American Optical Co.*

172—Relay Tester called "Vari-Pac" checks out the accuracy of devices used to protect electrical equipment (overload relays, circuit breakers, etc.); also provides infinitely variable a-c voltage—0 to 15 volts—for laboratory or maintenance service. *Sel-Rex Corp.*

173—Bulk Conveyor Elevator has special cantilever design for ease in cleaning—this permits removal of casing covers, pulleys, and belting without disturbing bearings, mechanical seals or operating machinery. Five sizes, capacity to 40 cfm. *Bucket Elevator Co.*

THERE'S A



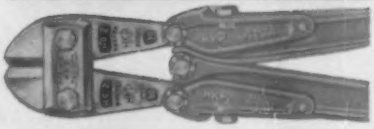
The PORTER CENTER-CUT CUTTER — in 6 sizes, for cutting up to ¾". Our most popular tool. Ideal for general free cutting of soft and medium hard steel. Other models for HARDER METALS.

HKP

PORTER CUTTER

The PORTER WORK-STATION CUTTER — in 3 sizes, up to ½" capacity. For continuous cutting operations it can increase the metal-cutting capacities of one man up to 300%! Saves time, work, money! Leaves one hand free to feed or hold material.

FOR EVERY



The PORTER HEAVY DUTY CUTTER — in 3 sizes, up to ¾" capacity. Specially designed for those rugged jobs in steel mills, construction companies and other heavy industries!

METAL CUTTING JOB

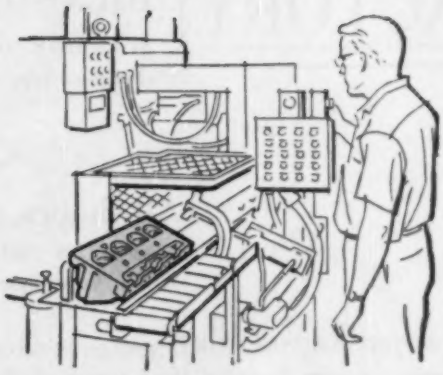
SAVE TIME AND MONEY!
Over 100 Cutters in Various Sizes and Types — Hand or Power Operated

Contact your Industrial Distributor or write direct for your **FREE CATALOG!**

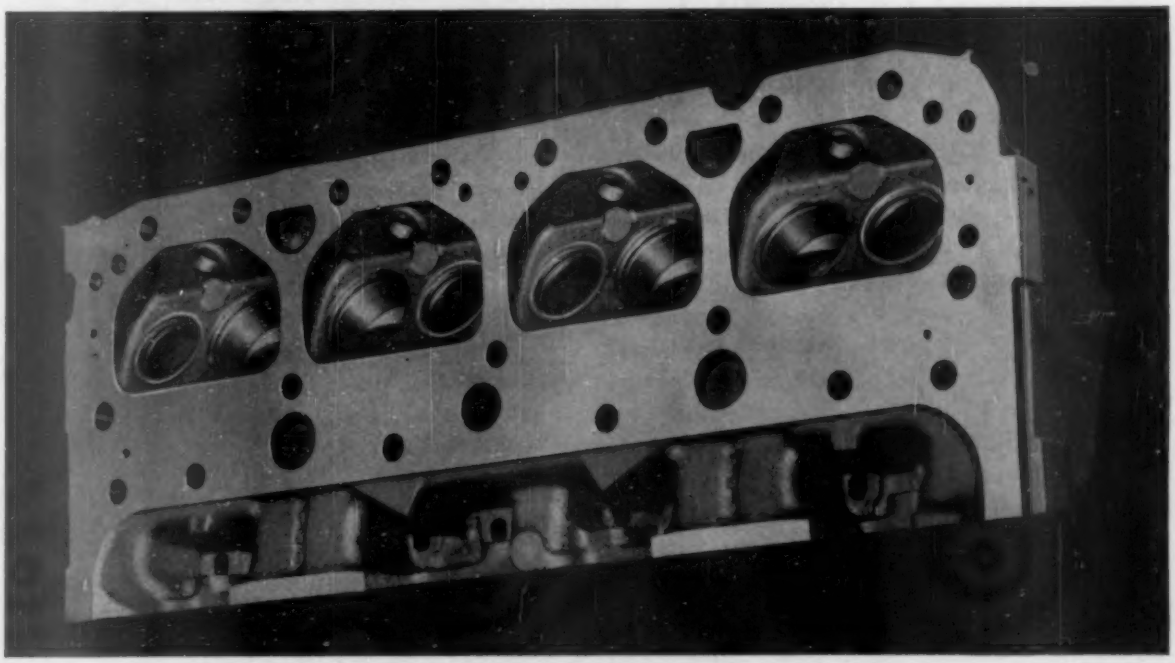
CUT— up to ¾" rods with HAND OPERATED TOOLS up to 1⅜" rods and 2½" power cable with POWER OPERATED TOOLS.

H. K. PORTER, inc.
Somerville 43, Mass.

TOCCO* Hardening of Exhaust Valve Seats



Saves Cost of Expensive Alloy Inserts



• *In just 12.5 seconds* the four valve seats on this heavy-duty truck cylinder head are heated to 1650°F. An area of $\frac{3}{32}$" perpendicular to the valve seat is hardened to a minimum of 42 Rockwell C. TOCCO's uniform, localized hardening permits the elimination of costly alloy inserts. The cost of induction hardening is a small fraction of the cost of these alloy inserts.

This unusual application indicates the wide scope of cost-saving possibilities available through the educated use of TOCCO Induction Heating. If your products require hardening, heating for forming or brazing, it's better than an even bet that TOCCO Engineers can save you money.

THE OHIO CRANKSHAFT COMPANY

Mail Coupon Today — NEW FREE Bulletin

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Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating."

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FACTORY
MANAGEMENT AND MAINTENANCE

IDEAS OF THE MONTH

By LEWIS K. URQUHART, Consulting Editor

(For more information, circle item numbers on Reader Service Card next to back cover)

All-shapes vise (*Wilder*) holds "impossibles." Two pivoted jaws on a swivel turret replace sliding front jaw. Combination of swivel and pivoting action allows them to equalize and adjust to almost any shape. **(291)**

Now a packaged plan puts profit sharing for retirement within reach of any company regardless of size or location. Sponsored by pension consultants (*Burroughs*) and a Boston mutual investment fund (*Putnam*). **(292)**

Using paper plates in your cafeteria? Then someone in your organization will certainly rate a 25-piece sample kit (*Paper Plate Association*). It's designed to show basic types and to make it easy to choose the right plate for each specific need. Free, of course. **(293)**

How to select a slide rule is the subject of a mighty readable 24-page booklet (*Keuffel & Esser*) written for students and professionals alike. Describes not only the standard Log Duplex Decitrig rule used by most engineers, but also Polyphase and Mannheim types, special-purpose models, and pocket versions of most standard rules. **(294)**

Speed Chief is a new stainless steel tape (*Disston*) with a faster rewind —50 ft. in 3 seconds. Comes in 50- and 100-ft. lengths. **(295)**

Boy, they got tools! That thought kept running through our head as we thumbed our way through an eye-filling catalog (156 pages) of hand tools and shop equipment (*Snap-On*) for production and maintenance. **(296)**

That better mousetrap has now been built. It's an aquatic trap (*Self-Sett*) capable of catching 100 or more mice at a single setting. No poison. No electricity. The mice simply walk the plank and fall in. **(297)**

For those cold spots, indoors and outdoors, there's Infratube controlled area heating (*Quartz Products*). Infratube's fused quartz element is a jim-dandy infra-red emitter. Puts the heat when and where you want it. **(298)**

Steel users will want a 5-page wall chart (*La Salle Steel*) listing all AISI grades of cold-finished bars. In addition to La Salle's own products, this free chart lists 8 screw machine, 25 resulferized carbon, 64 open hearth, and 140 alloy steels. Complete chemical analyses. Machinability in surface feet per minute and as a percentage rating compared with AISI B1112. **(299)**

For strong bonds there's Instant-Lok 4300 (*Structural Products*). This non-flammable, water-thinned cement requires no ventilating hoods or spray booths. Spray, brush, or roll on. Bonds almost anything. **(300)**

Christmas suggestion: Buy new wide-vision helmets (*Air Reduction*) for your welders—and increase their field of vision 120%. Lens areas, 4½x5¼ in. Wonderful for men who have to wear bifocals. **(301)**

Slip resistance is the endearing quality possessed by Stoncap (*Stonhard*), a new resurfacing material for floors, stairs, ramps, metal catwalks. Ready for foot traffic within 5 hours, for trucks within 24 hours. Handsome colors: maroon, gun metal, forest green, light green, light grey. **(302)**

No paper taste with a new hot-drink cup (*Dixie*). Miro-Glaze is made from a pre-plastic-coated stock. Polyethylene lining is so tough you can boil water in the cup (if you insist) without harming it. **(303)**

Soft sponge face pad is the "something different" about a couple of models in a brand-new line of cup-type safety goggles (*Bausch & Lomb*). Snaps at top and bottom make pad easy to detach for cleaning or replacement. **(304)**

No-Mar plastic hammers (*Hunter Tools*) can now be had with screw-in replaceable tips. Three grades: soft (red) plastic; hard (green) plastic; very hard nylon (cream). Sizes: all the way from 5-oz. to 2-lb. hammers. **(305)**

Window washing goes faster with the new Whirlaway (*Osrow Products*). Horsehair brush rotates at 1500 rpm. Built-in sudser. **(306)**

Desk and drawing board combo (*Standard Pressed Steel*) looks like the ideal work center for engineers. All-steel, L-shaped unit provides 27 sq. ft. of surface, puts board within a short idea's distance. **(307)**

Three winter liners (*Gentex*) for wear under safety hats are (1) Snowflake, of knitted stretch nylon and weighing only half an ounce, (2) Frost King, of woven nylon with soft brushed inner surface, (3) Polar, of wind-resistant fabric lined with soft pile, for extreme conditions. **(308)**

Imagine a plastic respirator (*Welsh Mfg. Co.*) that weighs only 2.1 ounces! For protection against dust, pneumoconiosis-producing and chromic-acid mists. Eight parts quickly assembled without clips or fasteners. **(309)**

Us safety ladder boosters are glad to welcome another entry (*American All-Safe*) which is constructed of polyester resin (*Hooker*) reinforced with glass fiber. Rungs are locked in by patent-applied-for method. And are rough-surface to preclude all possibility of slipping. **(310)**

More Ideas of the Month in Press Time Report following page 34

1. Worker phones . . .

2. Clerk writes . . .

3. Stock man picks . . .

4. Driver delivers . . .

5. Worker receives . . .

6. Clerk records.

Here's a

Swift ordering, quick delivery, sure inventory controls—they're all here in this spick-and-span storeroom.

"CLEANEST maintenance storeroom I ever saw," says FACTORY's Carl Wyder about Columbia-Southern Chemical Corporation's set-up at Corpus Christi (Texas). Maintenance Supervisor Ralph Price has his own superlative: Biggest improvement in this top-notch storeroom in the last five years is the delivery system (photos at left) that keeps maintenance humming.

But whether it's cleanliness or efficiency, Columbia-Southern's system works so well that Editor Wyder chooses it to show how many ideas in "Here's How to Hit Waste in Maintenance Stores" (page 126) work out in practice.

So, if you'd like to bring your maintenance storeroom up to standard, listen while Mr. Price and Stores Supervisor M. J. Lynch answer Wyder's question (heavy type) about their stores system:

How long have you been concerned with storeroom practices?

We've been refining stores control for the last 20-odd years. We aim to give maximum service with minimum inventory investment.

Does this maintenance storeroom pay its way?

That's like asking if maintenance pays off. The answer is "yes." How? Less production downtime, more efficient maintenance.

What does your storeroom cost?

People involved in all its services account for about 4% of the total maintenance hourly payroll.

Who are these people?

Besides Lynch, an assistant storeskeeper, record clerk, order picker, receiving clerk, dispatcher, delivery man, two handy men. Lynch reports to the maintenance superintendent.

Tip-Top Maintenance Storeroom

What's a typical work load?

We average 80 deliveries a day covering about 240 commodities. Including requisitions from instrument and paint shops and several other minor sources (20% of total), we handle about 325 requisitions (limited to one commodity) each day. We write 350 purchase requisitions a month and 1000 receiving notices. At any time we have about 500 open purchase orders. We average three stockouts a day—that is, requests for items we don't have.

Your stock is immaculately stacked. Is this a frill? Does it pay?

Yes, it pays—faster counting, quicker order filling, less parts damage, and fewer mistakes. Also we use less space.

What do you include in maintenance stores?

About 9000 different items with a value of $600,000. We carry all supplies required by maintenance or production, including spare parts. But no raw materials.

What's the turnover rate?

We average 10% a month.

How big is your storeroom?

It takes 3000 square feet on the first floor, 13,000 on the second.

Where is it located?

In the maintenance service building, which is centrally located and contains most of the maintenance shops. But we feel that with modern materials handling and communications equipment we could move it to some perimeter location without appreciably affecting efficiency.

How do you protect stock from losses and deterioration?

Everything is kept under lock and key. Our Gulf Coast atmosphere, plus plant conditions, make corrosion one of our major problems. We combat it several ways. For example, all standard machine bolts, piping, structurals, as well as all screwed pipe fittings (including nipples) are galvanized.

Did you use any special method in assigning bin locations?

We locate items by groups, not by individual popularity. For example, we keep pipe fittings in one area, not scattered by type or size. Thus we need keep location indexes by areas only for such groups. We need individual locations only for our mechanical, electrical, and instrument spare parts.

Why do you have a delivery system?

It pays. Our plant covers a nearly rectangular area some 1900x2300 feet. And we have some 250 maintenance men. In combination with our telephone order system, our setup minimizes waste in maintenance labor and materials.

There are only two situations in which material is picked up at the storeroom. One is an emergency, when the requisitioner is close by or will pass by on his way to the job; the other: when a person can't describe the item he wants by phone and must bring in the old piece for identification or come in to check what's available.

If we think in terms of 100 deliveries a day (we had that many when we shifted to 100% delivery service) we can save at least 30 minutes per call, or 50 man-hours per day. Against this we had to add a delivery man, but have eliminated a window man. Of course, we must assume some waiting time at the other end, but that's controllable.

Is this delivery system strictly for maintenance?

No. But because maintenance is by far the biggest user it operates the service for all departments. Our dispatcher handles requests for storeroom deliveries and for plant vehicles. One of our first problems was to make use of all the dispatcher's time. So we combined the recording of storeroom requests with a radio dispatching system for plant vehicles. We have a separate telephone circuit for each.

For simultaneous calls on both circuits or a series of vehicle requests coming in while the dispatcher is handling a storeroom request, we use a Bell Telephone automatic tape recorder. This records up to 30 vehicle calls—it's operated by flip-over switches—although rarely more than two or three get recorded before they are removed.

How do you handle second and third 8-hr. shifts?

The dispatching system works only the day shift, when most maintenance is done. For skeleton crews on the other two shifts material is obtained through a production foreman who knows the ropes.

Does maintenance get priority in use of handling equipment?

For maintenance deliveries we use a towing unit with extra trailers. Also a three-wheel, stake-body truck. For heavy material we use a plant winch truck that is part of the radio-controlled fleet of fork trucks, pick-ups, and winch trucks. This fleet is dispatched on a first-come, first-served basis.

What is the delivery procedure?

We have 25 numbered delivery boxes spotted throughout the plant. Also delivery boxes in all maintenance shops, listed by departmental numbers. When a man phones for material he specifies in which box he wants it delivered. As the dispatcher receives the call he writes the requisition and passes it on to the order picker for processing.

Except for late morning (there's a one-hour delivery moratorium between 10:30 and 11:30), deliveries are made about every 20 minutes. Our last check showed an average of 17 minutes between receipt of order and delivery to station.

Turn the page

Now ready—FACTORY's 1958 Index. For free copy, write FACTORY Reader Service.

LOOK
at the
Advantages of
Van-Cor
PIPE, FITTINGS, VALVES

Van-Cor is an unplasticized polyvinyl chloride that resists the corrosive action of hundreds of industrial acids and alkalis as well as sewage waste and brine. Van-Cor piping costs less, is lighter in weight, and easier to install than conventional pipe. It is readily formed, machined, threaded and welded. Available in normal and high impact types. On many installations where metallic piping was eaten up *in a few months,* Van-Cor pipe has served *for years without deterioration.* Thus it quickly returns its cost and pays handsome dividends.

Van-Cor sheets are also fabricated into ducts, hoods, chemical tanks, fume-stacks, etc.

Write for Catalog and Name of Nearest Distributor

INDUSTRIAL DIVISION OF...
COLONIAL PLASTICS MFG. CO.
Subsidiary of THE VAN DORN IRON WORKS CO.
2685 EAST 79TH STREET CLEVELAND 4, OHIO

MAINTENANCE STOREROOM

Begins on page 98

What's this "one-commodity" rule?

We have a strict rule: only one commodity per requisition. Reasons: to segregate them in groups for posting to stores records, and to simplify machine accounting tabulations. But to ease the dispatcher's job, requisitions (triplicate snap-out forms) have room for three commodities. Thus the set can be broken down into one-commodity forms. These are partially sorted by group and commodity, using a "Sort-a-graph," by the order picker. The inventory clerk prices and extends requisitions every day, deducts quantities from inventory record. Standard unit prices are adjusted once a year, held throughout that year.

How do you keep records straight?

Every item—all 9000—needs an identifying number. Our three basic methods for numbering range between the extremes of a long number that needs a catalog reference and a short, simple number that a stores worker can remember and identify. Our aim is to simplify coding of popular commodities, especially when it's unlikely we'll add items later.

Our big problem is in mechanical, electrical, and instrument spare parts. Here we need larger code numbers for inventory expansion. In the mechanical spare-part group we use an 8-digit number. First three digits identify a sub-group of a general type of equipment, such as pumps or compressors. Next two digits indicate a specific make and size. Last three identify the exact commodity, by reference to records.

How do you control inventory size?

We use Kardex tray equipment, combined with traveling requisitions that are pulled when the order point is reached. Determining reorder point and quantity involves three types of items: those that move with some regularity, spare parts that move spasmodically, and slow-moving but critical spare parts.

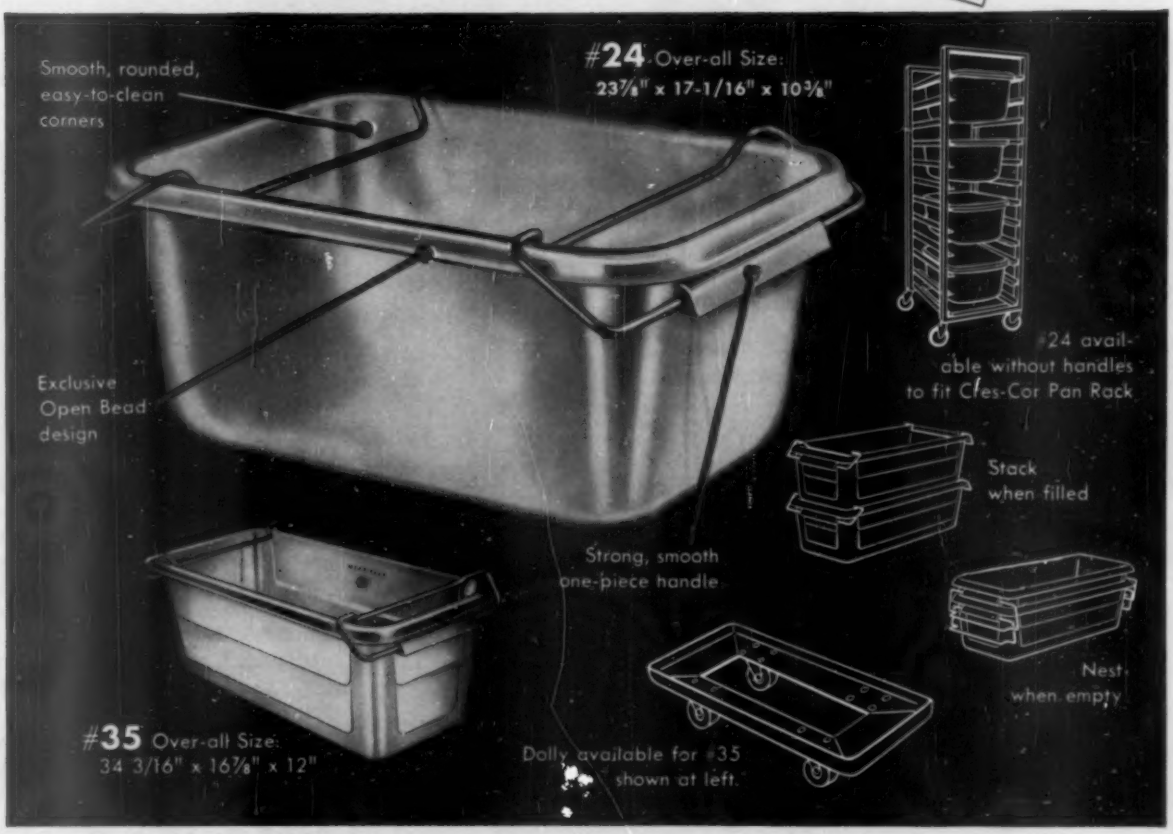
How do you control inventory of spare parts?

We haven't developed a mathematical approach for ordering such material. But we have worked out

now . . . handy smaller size . . . new features

Tote Boxes

by WEAR·EVER


Smooth, rounded, easy-to-clean corners
#24 Over-all Size: 23⅞" x 17-1/16" x 10⅜"
#24 available without handles to fit Cres-Cor Pan Rack
Exclusive Open Bead design
Stack when filled
Strong, smooth one-piece handle
Nest when empty
#35 Over-all Size: 34 3/16" x 16⅞" x 12"
Dolly available for #35 shown at left.

You asked for it . . . a smaller version of the famous Wear-Ever #35 Tote Box. It's our new #24, shown at top in the above illustration, and it's available *now*.

We've designed it particularly for you whose needs call for a lighter, smaller, easier-to-handle container. It is available without handles, to fit perfectly in a Cres-Cor pan rack.

This new box incorporates the same quality construction features as our standard size box—special extra hard wrought Wear-Ever Aluminum Alloy, sanitary open bead and extra strong, double-embossed bottom.

Like its big brother, shown in the smaller photo, this new box stacks when full, nests when empty and is available with your identifying imprint on side or end, if desired.

For full information on our complete line of food handling items, call your local Wear-Ever man, or send coupon below.

WEAR·EVER ALUMINUM UTENSILS

WEAR-EVER ALUMINUM, INC.
WEAR-EVER BLDG., NEW KENSINGTON, PA.

Wear-Ever Aluminum Inc.
6812 Wear-Ever Bldg., New Kensington, Pa.

GENTLEMEN: *I'd like to know more about your Tote Boxes and other handling equipment.*

☐ Send me your catalog. ☐ Have your representative see me.

NAME .....

TITLE .....

Fill in, clip to your letterhead and mail today.

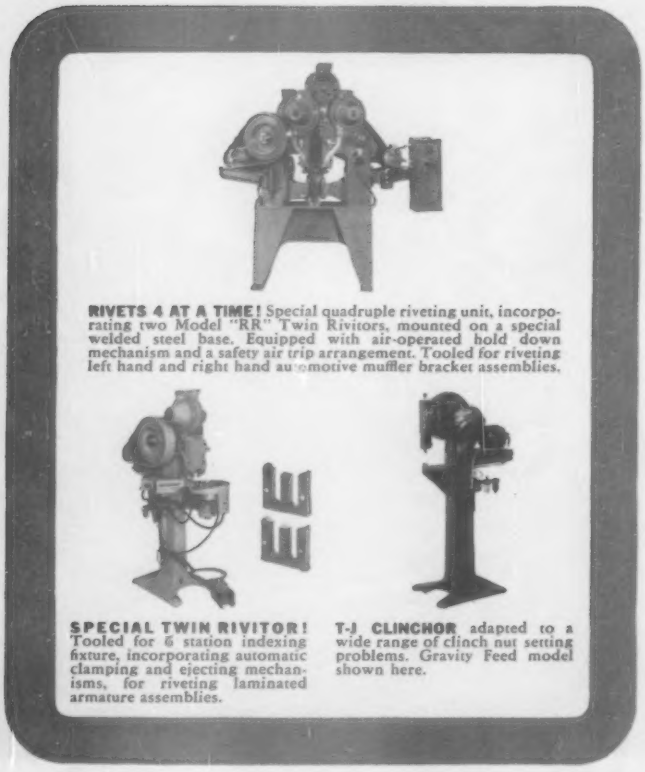
NEW IDEA! *Wear-Ever's new Nickel Scouring Cloth. Won't scratch, won't mar, far outlasts ordinary scouring cloths. At your dealer's.*

For more facts Circle 514 on Reader Service Card

Speed up RIVETING and CLINCHING

Automatic feeding and setting with

T-J



RIVETS 4 AT A TIME! Special quadruple riveting unit, incorporating two Model "RR" Twin Rivitors, mounted on a special welded steel base. Equipped with air-operated hold down mechanism and a safety air trip arrangement. Tooled for riveting left hand and right hand automotive muffler bracket assemblies.

SPECIAL TWIN RIVITOR! Tooled for 6 station indexing fixture, incorporating automatic clamping and ejecting mechanisms, for riveting laminated armature assemblies.

T-J CLINCHOR adapted to a wide range of clinch nut setting problems. Gravity Feed model shown here.

You'll realize *faster assembly . . . reduced labor costs* immediately, when you use T-J Rivitors and Clinchors for your production line. These performance-proved machines are designed to do a wide range of assembly jobs for aircraft, automotive, farm machinery—riveting jobs of *all* kinds.

T-J RIVITORS automatically feed and set solid rivets with high production. Electrically powered Rivitor sets solid steel rivets up to ⅞" long. Throat depths 8" to 36".

T-J CLINCHORS set clinch nuts with fully automatic operation, controlled by a single foot pedal. Available in Underfeed and Gravity Feed models, throat depths 8" to 36".

Send today for these helpful references: Rivitor bulletins 646 and 555 . . . Clinchor bulletin 555. The Tomkins-Johnson Co., Jackson, Mich.

T-J TOMKINS-JOHNSON
RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

Begins on page 98

techniques that bear down on every item. For example, requisitions for mechanical spare parts are reviewed weekly by a committee: production superintendent, maintenance superintendent, stores supervisor, chief maintenance engineer, general foreman of mechanical division.

Each requisition, regardless of cost, is first reviewed by the preventive maintenance engineer to see whether a preventive or corrective step is needed. He usually prepares a case history for the equipment and makes a recommendation. Often we defer purchases—even a three-month deferral means savings.

Does this deferred purchase technique ever get you into trouble?

Not so far, from a production standpoint. Of course, we run a calculated risk—there's no guarantee a stockout won't come. But we keep careful tabs on all deferrals by a tickler file (by date), maintained by the stores supervisor. Currently it covers about $200,000 worth of material, with some items projected to 1965. We set a review date for each item, usually about 20% ahead of the anticipated need, for consultation with the production and maintenance people most concerned.

But to exercise good control you need complete historical records of all repairs. We keep such records (dating back at least to 1945, some to 1935) on every piece of equipment. They show when a piece is worked on and what has been done. These records are a great help in reducing our calculated risks and predicting future requirements.

For what sort of item can you defer an investment?

Anything that isn't needed right away or for a long time to come.

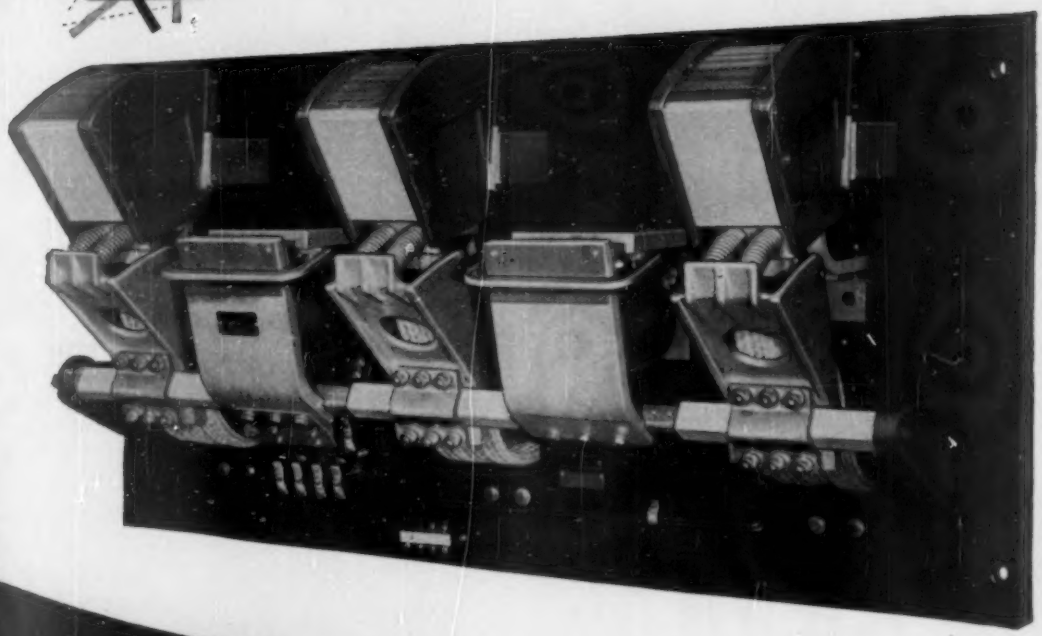
Have you developed any short cuts in stores paperwork?

We particularly like two short-cut techniques: One is what we call "chronological group buying," the other "give-away items." In this latter we charge out direct to "General Factory Expense" quite a number of items when received. This has cut in half the number of requisitions that must be priced daily, yet covers

For more facts Circle 515 on Reader Service Card

For more facts Circle 516 on Reader Service Card ➤

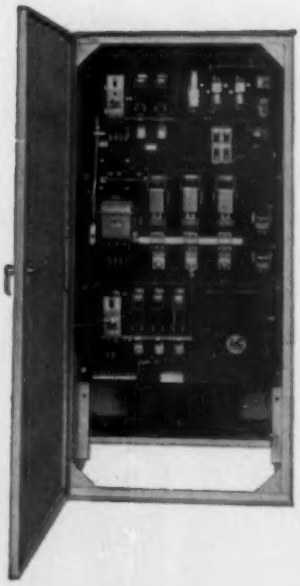
Plan to stay ahead... MODERNIZE!



Rugged* Simplicity

increases contactor life

Assures reliability of reduced voltage motor starters



ONE look reveals the clean, balanced design of Allis-Chalmers contactors. Fewer parts eliminate many potentially troublesome areas—mean less wear. Simple, solid construction and high interrupting capacity are positive assurance of reliability.

When you specify reduced voltage starters be sure to get the reliable, long life features provided by Allis-Chalmers contactors. It is these contactors that make all 600 volt Allis-Chalmers Size 4-8 reduced voltage starters the dependable performers they are.

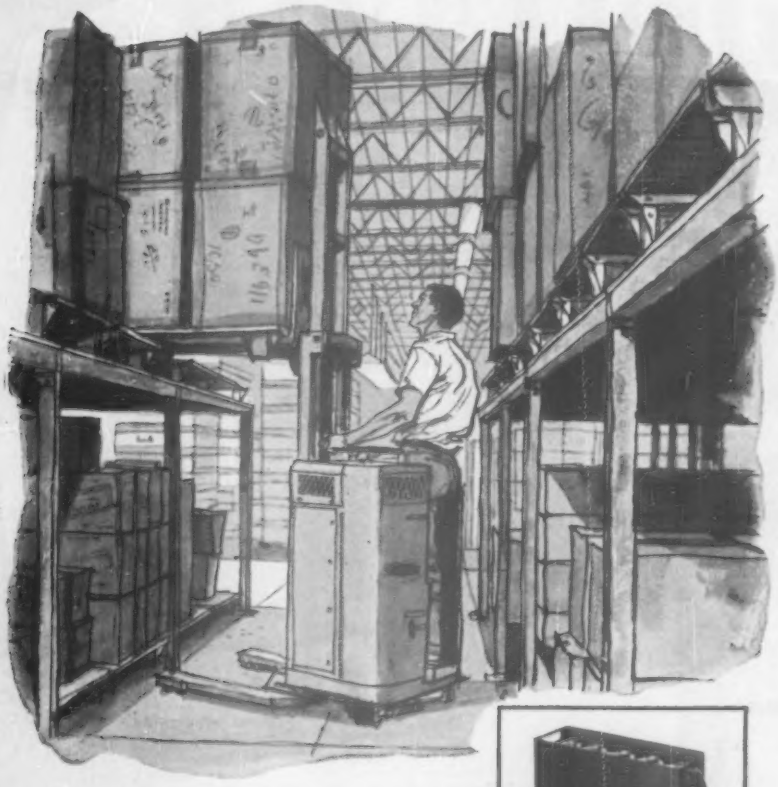
Get all the facts. Call your nearby A-C sales office or distributor, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

*7th meaning, Webster's New Collegiate Dictionary, Second Edition.

A-5784

ALLIS-CHALMERS

No warehousing tie-ups here...



because no sudden failure here...

For narrow aisle, walkie, or heavy-duty trucks . . . no battery equals the dependability of an Edison with new active material!

New active material—an Edison research exclusive—now gives the battery specifically designed for industrial trucks longer life than ever before. You can depend on an Edison for full-shift availability even in the most rugged service.

Another big advantage: the Edison job-proved automatic charge control. It cuts maintenance costs, reduces charging time, protects batteries against excessive overcharge.

Let us prove Edison is your best battery investment. See your Edison man for information—whether you want to purchase or lease—or write Storage Battery Division, Thomas A. Edison Industries, West Orange, N. J. In Canada: International Equipment Co., Ltd., 90 Bates Road, Montreal, P. Q.

50th Anniversary
EDISON Nickel-Iron-Alkaline STORAGE BATTERY
1908-1958

Celebrating 50 years of progress, production and continuing research . . . a background that brings you the world's longest lived, most dependable storage battery—*the battery that's built with tomorrow in mind.*

Edison NICKEL—IRON —ALKALINE Storage Batteries

. . . a product of Thomas A. Edison Industries of McGRAW EDISON

only about 10% of the dollar volume disbursed. The expense account is later distributed to all departments. Effect on our job material costs is negligible.

What are give-away items?

Currently, anything with a unit price of $1 or under that is purchased in quantities of $50 or under. In fact, we now favor raising the purchase quantity limit to $100. This will affect only a small part of our dollar turnover, but will substantially reduce the number of requisitions. Our give-away items are distinguished in the bins by special colored tags.

How does "chronological group buying" pay off?

We replenish some items on a calendar basis. It eases storeroom and purchasing paperwork and in some cases allows quantity discounts that can't be achieved when buying on an erratic basis.

Have you any executive controls over inventory?

We keep statistics of actual dollar inventory and percentage turnover by groups. These figures are plotted quarterly. Changes quickly spotlight abnormal trends by type of material. As a rule this correlation between the two holds: When inventory goes up, turnover drops.

Do these controls really work?

Over the past few years we have reduced total inventory. But mechanical spare parts have increased about 5% each year since 1953. We realize some equipment is reaching obsolescence in the eyes of the manufacturer. Thus spare parts require special processing, and we pay dearly for many of them.

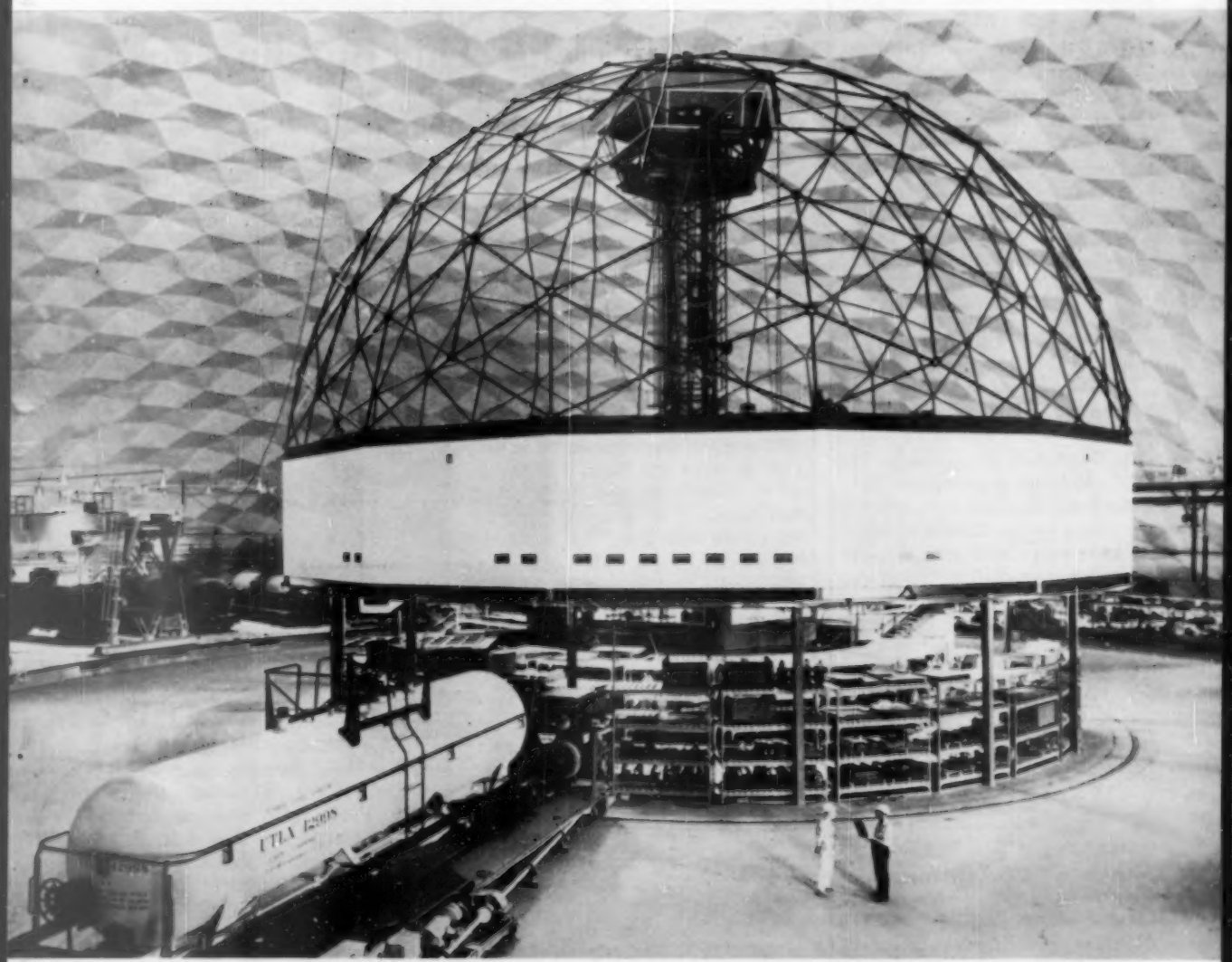
To identify the items that have been in stock longest and cost the most money, we used punched-card analysis. We multiplied unit cost by years in stock to develop a figure we call "retention cost index." Most of the parts high in this survey proved to be insurance items. They can't be touched. But once used, quite a few can be covered by the deferral technique, eventually reducing total dollar inventory. **END**

FACTORY
MANAGEMENT AND MAINTENANCE

PLANT OPERATING MANAGEMENT

CASE BOOK

WARREN J. KING: EDITOR



UNUSUAL CIRCULAR SERVICE DOME PUTS SUPPLIES CLOSE TO WORK STATIONS . . . PAGE 106

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NO. 15 DECEMBER 1958

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Thin Air Holds This Building Up

It takes no more air pressure to hold up this new building than it does for a man to puff his cheeks. That's the word from G. T. Schjeldahl Company (Northfield, Minn.), designer and user of the 304-ft.-long polyester film structure (photo). It houses the production facilities of the company's Balloon and Special Fabrics Division.

Cover for the semi-cylindrical building is "Scotchpak" reinforced plastic (Minnesota Mining and Manufacturing Company, St. Paul). This material is heat-sealable and has a grid of nylon fibers embedded in the film to make the fabric run-proof. As for strength, the semi-transparent film structure is sturdy enough to let a man walk along its crown.

According to Schjeldahl operating executives, heat savings alone will pay for the plastic skin of the building within five years. That's because it will admit up to 2-million Btu.'s of solar heat per hour on sunny days. Thus the expense of operating regular heating units will be greatly reduced. In summer, sun shields and air conditioners will keep temperatures comfortable.

How vulnerable is the structure to puncture? Not at all. As proof, the Schjeldahl people slashed a 7-ft. hole large enough for a man to slip through in the side. Later resealed it without weakening the structure or deflating it. Similarly, an archer's arrows passed through the building without affecting its rigidity. In fact, the structure is so rigid that the company believes it can withstand winds of hurricane force.

Furthermore, the building cover is fireproof. Even when a blowtorch melted a hole in one side, the Scotchpak material failed to catch fire. Likewise it's not affected by heat, cold, moisture, grease, or solvents. And the material won't dry out or become brittle.

Within the film structure a second structure, located at the north end, houses restrooms, heating, air conditioning, and blower equipment. Employees enter and leave the building through airlock doors.

Places Services Right in Center

(Cover story)

Inside the new giant circular-dome repair and maintenance center of Union Tank Car Company at Baton Rouge (La.) is another geodesic-type structure. It's as high as a seven-story building, has a 100-ft. diameter. Serves as the hub of operations by providing . . .

. . . *A 7500-sq.-ft. floor-level materials storage area* for supplying car repair stations. This brings all of the building's 30 repair stations within 50 feet of parts and tools. A raised mezzanine in the center of the area provides offices for supervisors and houses the plant's telephone dial system.

. . . *Administrative offices and employee quarters.* This enclosed area, supported by 15 steel pillars, is 18 feet above floor level. It has adequate space for general administrative offices, a reception room, employee dining room, and one

locker-shower facility for every two employees. And a concrete observation station on top of this area will permit future construction of additional offices.

. . . *A glass-enclosed control tower* 80 feet above the work floor. From this nerve center the work coordinator keeps in constant touch with all work stations by telephone. Also screens inspection activities (as cars enter the shops) on closed-circuit television.

Around the inside of the tower office is a desk-high shelf divided into sections corresponding to tracks located directly below. To record the status of the work on each track, the work coordinator makes notations on the shelf's thick plastic surface with a grease pencil, can make necessary changes in records with a quick erasure.

The 110,000-sq.-ft. yellow and blue Union dome itself is the world's largest circular building. Its base diameter is 384 feet, rises 120 feet, and has no internal supports. And construction costs were well under $10 per square foot.

No Corners Cut Here

Having trouble protecting corners of stacked material from knocks by fork trucks or trailer trains? If so, these portable corner guards may help. Behr-Manning Company of Troy (N.Y.) tried them in receiving and raw material stores. Found them so effective it now uses them whenever possible.

Units on main thoroughfares are painted with a distinctive black-and-white diagonal strip. Those on secondary aisles are one color. The homemade sheetmetal guards are 24 inches high, 18 inches wide, with a 2-in. flange at the bottom to add stability. Can be easily moved as only their own weight holds them in position.

Gives Over-all Work-Effort Picture

All the wall charts in the above photo show the performance of production departments at the Northrop Division of Northrop Aircraft, Inc. (Hawthorne, Calif.). The artist (background) is just recording a new weekly rating. The information comes from a new system called PACE (Performance and Cost Evaluation). It measures group performance in a non-repetitive shop by applying a sampling approach to efficiency rating. Here are some benefits resulting from PACE:

- Productivity is on the rise—on every shift.
- Supervisors make a point of doing deskwork during the middle of the shift so they can be on the floor to halt the shift-change slump.
- Presence of a measurement system encourages supervisors to straighten out inter-departmental production snags.
- Analyzing PACE observation data reveals production bottlenecks.
- Study of PACE records demonstrates clearly that layoffs disrupt production least if not strung out over a long period of time.

The PACE system isn't complicated. It can be used in the shop, engineering department, or office area. Here's a shop example:

1. Trained observers first conduct a two-week basic study of the department they'll measure. They learn the nature of the group's operation, the number of personnel involved, man-hour budget, schedules, and particular department problems.

2. Next the program starts. Observers tour the department's area several times a day at random hours, using different routes of approach. During each tour they record the number of personnel idle or not working at assigned tasks and the number out of the area. They can determine, by observation, the group's effort. This effort rating is a percentage of the average sustained effort of an efficient worker.

3. These data are then converted to a PACE Measurement Index. This is done by first determining the net number of workers occupied in the area (number assigned plus or minus workers on loan and minus those idle or out of the area) and then multiplying this figure by the effort rating. Next this result is divided by the number of workers assigned to the area plus or minus those on loan. Finally, multiplying the answer by 100 gives the area's PACE percentage.

4. The PACE Measurement Index is plotted on a chart in weekly increments. It is the basic index for indicating the trend of group effectiveness. The goal for each organization is to bring the PACE line up into a "control area" of the chart. This control area ranges from 85 to 100% of optimum normal effectiveness. Northrop investigations indicate 55 to 65% is common in the airframe industry. Similar lags in efficiency may be found in other industries where individual production rate controls are difficult to apply. The beginning point of the PACE line, however low, carries no immediate penalty; what matters most is the line's trend and rate of change.

5. When the PACE line is established, a corridor leading into the

control area at a selected target rate is also entered on the chart. The group is expected to keep the PACE line within this corridor until it reaches the control area.

The PACE line is only a measure of the diligence with which an organization applies itself to the job. It needs to be supplemented by other indices to round out the over-all comparative picture, as follows:

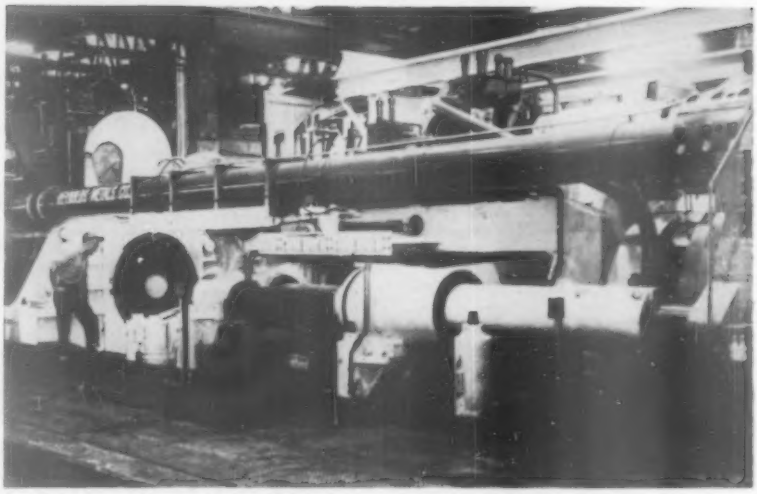
Personnel Index—Compares department population for the current week to a base week. As PACE improves, fewer people do a given task when all other factors are equal. So, as the PACE line goes up, the personnel index goes down.

Budget Realization Index—This is the ratio of earned hours to actual hours spent (with the learning curve taken into account). As the PACE line goes up toward the control area, the budget realization index usually rises also.

Schedule Index—Compares actual production to scheduled production. Being ahead of schedule is just as bad as being behind and creates its own set of problems. Schedule realization is controlled by varying the number of personnel.

Quality Index—This is established from a formula developed by the quality control department. Northrop has learned quality increases as PACE increases.

Shortage Index—Shortages affect PACE. Personnel running short of parts tend to slow up or "stretch out" work to keep busy. Shortage index compares number of shortages to total number of different parts that should be available.



KING-SIZED EXTRUSION PRESS BOWS IN

A combination of features makes this the most flexible 6000-ton extrusion press ever built. Features include pushbutton shift from high- to low-speed operations, rapid container changes, extensive mechanization, independent mandrel movement, and provision for extruding rectangular shapes. The $2.5-million giant will produce primarily extruded aircraft shapes at the Phoenix (Ariz.) plant of Reynolds Metals Company. The property of the U. S. Navy, it was designed and built by Loewy-Hydropress Division of Baldwin-Lima-Hamilton Corporation (New York).

Prexy Tells All to Employees

It's 8 a.m. on Saturday. And the family in the above picture is getting the lowdown on daddy's company operations from his boss, Northrop Aircraft's president, Whitley C. Collins. The telecast plus a radio broadcast carried one hour later is carried on commercial stations in the Los Angeles area.

Idea for the personalized report to employees started years ago, when the company was small. Then regular reports were made to small groups of employees right in the plant. Now the organization numbers close to 25,000 employees, is spread all over the city of Los Angeles. So the soapbox approach isn't practical any more. Printed reports proved too impersonal and cost about $2500 to issue. Also, they failed to deliver the message to everyone's satisfaction.

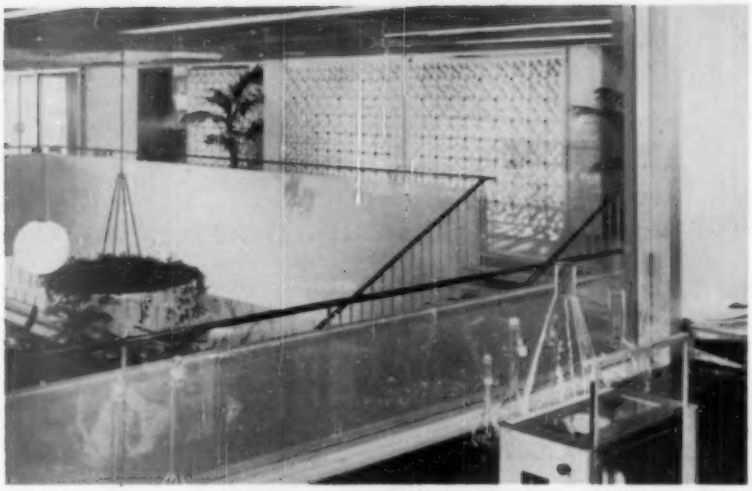
The television-radio report to employees costs the company only about half as much as the printed reports. And it does a better, more timely job. For one thing, the lead time from composition of the text to delivery to employees is shorter than it was with a printed message. Actually the talk was filmed the night before the telecast.

Announcements of the telecast and broadcast were carried in the company paper and on bulletin boards. But no public announcement was made in local papers.

Traffic News Averts Jams

The pistol-packing plant protection man you see in the photo is warning Hughes Aircraft Company employees of traffic tie-ups they can avoid on their way home. He's using the plant public address system to get the word around. Gets his traffic information from a unique network called Sigalert.

Sigalert network provides fast, direct communications between police departments in Southern California and the general public. It was originally designed for use in Civil Defense, but was quickly adopted for



LABORATORY WITH A VIEW

Technicians look out on a lush oriental setting at the new Stuart Company pharmaceutical plant in Pasadena (Calif.). The laboratory is strategically located on a street-level mezzanine overlooking an unusually attractive and eye-catching two-story atrium. Generous use of glass enables visitors to view testing and control procedures without disturbing technicians or contaminating test elements. Grillwork of milk-white concrete used throughout the plant contributes greatly to the appearance of this manufacturing facility.

---

the purpose of broadcasting all emergency bulletins. Here's how accurate details from authorities on the scene are relayed to all concerned in a few seconds:

Officers at the scene of emergency road conditions transmit up-to-the-minute information over the police shortwave network to the downtown control center of the Los Angeles Police Department. From here the information is at once relayed on a subaudible frequency to all points equipped with Sigalert receivers, including radio and television stations. These points in turn flash the message to the public.

Average time from the moment a bulletin is radioed in from the scene until it is placed on the air over commercial channels is less than two minutes. Listeners hear the actual message as sent out from police headquarters. If the danger is a continuous one, warnings are repeated at frequent intervals.

Sigalert warnings received over car radios are usually not early enough to cope with the end-of-the-day rush, when thousands of automobiles pour onto the crowded highway system in a matter of minutes. Things just happen too fast. And a single stalled vehicle or smash-up can often lead to a tie-up that will jam a main thoroughfare for hours.

To avoid such tie-ups drivers must be alerted before they enter the traffic stream so they can select optional routes. With this thought in mind Hughes adopted the use of Sigalert. The Aircraft Company's plant protection office monitors all bulletins, screens out those that might concern Hughesites for broadcast over the PA system.

85-Ton Door Guards X-Ray Lab

There are no hinges on this 5-ft. thick concrete door. Yet it opens and closes many times a day at Mesta Machine Company's new betatron building in New Castle, Pa. It permits castings weighing 50 tons or more to move quickly in and out of the thick-walled building where they're x-ray-inspected by the 24-million-volt betatron unit.

Low-bed, track-mounted, electrically driven cars carry giant castings into the radiographic chamber. Several cars can be joined to take more than one casting inside the test chamber each time the door opens. The 85-ton concrete door (measuring 13½ feet high and nearly 18 feet wide) rides on the lead car. These units move at a speed of 50 fpm.

With the door closed there's a solid concrete radiation shield around the x-ray unit. The 24-million-volt betatron unit (Allis-Chalmers Manufacturing Company, Milwaukee) hangs from an overhead traveling crane within the inspection chamber. This permits easy positioning for x-rays and eliminates the problem of shifting heavier castings once they're inside the building. An overhead crane is available to move lighter castings—weighing less than 10 tons.

Operating men enter and leave the test chamber through a second door. This entry leads to the control panel and film processing area. Electrical interlocks cut all power to the x-ray unit should either door be left open by accident. The betatron inspects castings with 8-in. walls in only 1½ minutes. Similar non-destructive tests took two days with radioactive cobalt.

"Eye" Traces Die Grinding

How do you know when you've finished final die grinding? Watch till the sparks disappear? Listen for motor speed changes? Adamas Carbide does it with a "tuning eye" current detector. This device continues to blink as long as there's any load on the grinder motor. But the moment motor current drops to idling value, the blinking stops.

Adamas built the detector with less than $25 worth of components, feels it's a far more accurate method for indicating completion of the work than relying on the operator's eyes and ears. And if you're circuit-minded, here are the details of its operation:

Rectified voltage from the second-

ary of a current transformer in one of the grinder-motor incoming leads is fed to the grid of an electric eye tube. The cathode of this tube is supplied from a rectifier across the line, while the tube target is fed directly from the 120-volt line. One potentiometer in the grid circuit and another in the cathode circuit control sensitivity and adjust for changing line voltage and motor idling conditions. Current transformer was made from an existing radio transformer by adding a primary of several turns of No. 14 wire. Assembly is mounted in a small steel case where the grinder operator has a clear view of the "eye."

Source: Gerard Scheyer, Plant Engineer, Adamas Carbide Corporation, Kenilworth, N. J.

Big Lift Hoists 90-Ton Pipe

This "lifter-tipper" may look like a refugee from Planet X, but it's not. It's a new rig built by United Concrete Pipe Corporation (Baldwin Park, Calif.) to move 24-ft. lengths of concrete pipe weighing 90 tons apiece. Also tips them to a horizontal position where necessary.

Cushioning the mobile giant and supporting it on the powder-fine beach sand are 12 pneumatic tires (B. F. Goodrich Tire Company, Akron). Handling is smooth and gentle with rib-design nylon tires deflecting about 20% under the 240,000-lb. load. Wheel assemblies are double duals on three single axles, one at front, two in rear.

Cuts Bar Stock Handling Costs

Here's a system for storing and handling bar stock that provides maximum space usage and selectivity and also cuts labor costs up to 50%. It's installed at the new plant of the Allen Manufacturing Company (Bloomfield, Conn.). It enables one man using a specially designed stacker crane to handle bar stock on tiered steel rack with efficiency and speed.

The stacker crane with operator aboard is the heart of the new system. It rides forward, backward, and sidewards at 125 fpm.; up and down at 20 fpm. The forks on both sides make a single run down the 5-ft. aisle to service the 14½-ft.-high racks on both sides.

Storage consists of five rows of the tiered steel racks, which are capable of holding 4.6-million pounds of bar stock. The three inside rows of racks have arms on both sides, while the two outside racks have arms only on the inside. Each rack has eight levels of arms supported by three uprights.

Managers Vie for Winning Ideas

Want to get some top-notch ideas to make your next big project better? Then try a contest for managers. Anaconda Wire & Cable Company did just that and results were excellent. Of 300 supervisors, 106 submitted ideas for making the company's new plant at Watkinsville (Ga.) the best in the industry. And almost all suggestions were good.

Contestants were asked to enlarge on the theme, "If I were the manager——." Rules for the contest included the following:

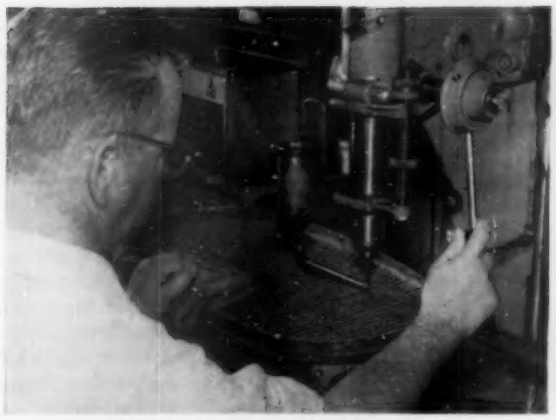
1. All mill, office, and staff supervisors were eligible to enter.
2. Contest ran for one full month.
3. Awards were given for the best ideas to improve departmental operating efficiency and reduce costs. First prize was $250; second, $150; third, $75. And ideas worth using were awarded $25.
4. Judges were three top manufacturing men.
5. Entries were submitted through the manager of the mill where the supervisor worked.

The winner of the contest submitted 10 typewritten pages of excellent ideas. He is technical supervisor of an Anaconda plant in New York State. The second-place winner was a California personnel manager. The third-place winner was a Michigan plant foreman.

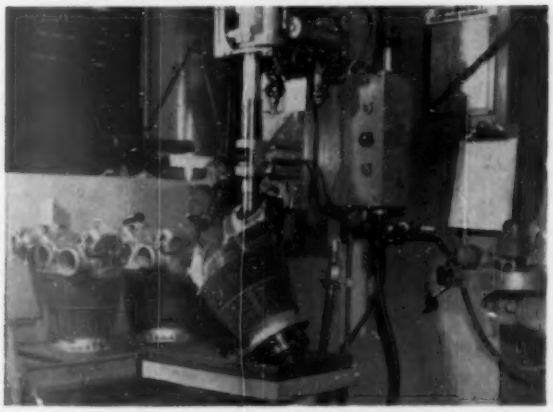
Checks 'em While They're Hot

Metal "heats" now get faster, more accurate spectrographic quality checks at Haynes Stellite Company, Division of Union Carbide Corporation (Kokomo, Ind.). Responsible for the improved procedure is an automatic x-ray fluorescent spectrograph called Autrometer. This machine compares a sample against a known standard by alternately bathing each in a beam of x-rays.

Developed by North American Philips Company (White Plains, N. Y.), the Autrometer works like this: Every element in an alloy gives off radiation at an intensity proportional to the amount present. The Autrometer automatically prints a tape recording the results. This is expressed as a ratio between the known standard and the unknown sample. Quality control now takes minutes where it used to take days.



1. PRECISION SWEDGING IN HALF THE TIME.



2. EVERY DAY, 100 VALVE HOLES REAMED.

3. SPOT FACING WITH UPSIDE-DOWN DRILL.

Standard Tools Pay Off With New Tricks

Special adaptations of drill presses help United Air Lines duplicate precision and efficiency of original plane makers in the "remanufacture" of engines at its San Francisco Engineering and Maintenance Base. And the operation is tooled at a fraction of the capital outlay needed for conventional tools.

United rebuilds about 1500 engines a year. Uses specially set-up Delta drill presses (Rockwell Manufacturing Company, Pittsburgh) as one of the principal tools. Here are four ideas showing how United uses drill presses to keep its 195 aircraft in top operating condition.

1. With a special 9-in. extension between head and motor this 17-in. drill press swedges the ends of 250 oil cooler tubes per hour. That's twice as fast as a portable pneumatic swedging tool performed this precision operation.

Generally, United replaces about 1500 oil coolers during an engine overhaul. Old tubes are removed with hand tools, new ones inserted in their place. Then the extended drill head swedges tube ends into the 18x28-in. end plates. The swedging tool produces tapers from 0.20725 to 0.20750 inches. After swedging, United grinds tube ends, then tests the cooler under pressure.

A simple block casting drilled to fit over the press column and to accommodate locking screws was used to extend the drill head. This increased the distance between spindle and column from 8½ to 17½ inches. Adaptation required lengthening of belt and guard, too.

2. Combining a hydraulically elevated table, a hydraulic boring device, and a drill press lets United precision-ream valve holes at low tool cost. Tolerances on this operation are plus or minus 0.0005 inch from the center of the hole.

Here's how the set-up operates: A hydraulic cylinder raises the worktable to the correct position after the cylinder has been placed on it. The hydraulic boring device holds the cutting tool and provides uniform feed. And the drill press, geared for 200 rmp., rotates the spindle of the boring device. The resulting cut is 0.015 inch through a 4-in. spindle travel. The spindle travels 2 inches per minute while the tool traverses 51 surface feet. Previously this job had been done on a less accurate, manually operated drill press.

3. Securing a drill press upside-down on its column simplifies spot facing of an 18-in.-diameter engine mounting plate. This operation refaces bearing surface of 24 bolt holes on plate's outer edge.

A rotary table mounted above the press positions work directly over the spindle. The shank of the spin-

dle-held spot-facing tool feeds up through a hole in the worktable and a bolt hole. To this the operator attaches the spot-facing tool and starts the drill. Tension in the spindle return spring, operating downward during refacing, facilitates operator control during cutting. After refacing each hole, operator removes cutting tool and rotates table to next bolt hole.

With the worktable free of the tool's own mounting, the hard-to-handle plate is readily positioned. And by using holes at various distances from the center of the rotary table and moving the table back and forth, United uses this set-up for all multiple-step jobs requiring work on the periphery of a circle.

4. It's possible to drill holes at any point on 4x8 ft. plywood panels using a drill press hanging from a building column. The plywood forms the flooring in aircraft fuselages during overhaul.

A welded bracket of 3½-in. pipe —the diameter of the drill press column—and two short lengths of I-beam suspend the drill press from the building column. For positioning, either the work can be moved or the drill press rotated through a 300-deg. arc. An air jet blows sawdust away from the cutting tool.

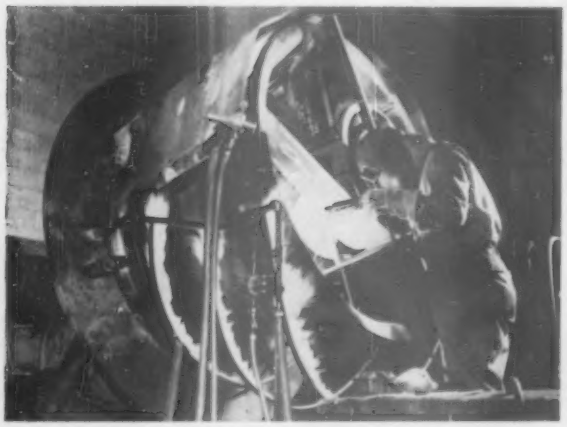
TV Camera Polices Plant "Blind Spot"

One security guard is all Hallamore Electronics Division of The Siegler Corporation needs to keep a constant eye on three exterior walls of its 110,000-sq.-ft. plant. From his station at one corner of the building the guard watches two walls (the south side and the rear). Simultaneously the camera gives him a clear, full-length view of the north side on a conveniently mounted TV monitor (photo). The front of the building is protected by other measures (including a pair of safe-locked and wired lobby doors).

Hallamore figures its surveillance method gives top protection against fire and unauthorized entry at minimum cost. The closed-circuit TV camera is mounted atop a 24-ft. tower and enclosed on three sides by a curved plastic sheet. Normally the camera provides a clear view of a 25-ft.-wide strip between the property fence and plant wall from immediately in front of the camera to a point 500 feet away. In addition, remote control switches at the monitor station enable the guard to swing the camera through a 200-deg. horizontal arc as well as up and down.

Entire monitoring system cost the company $4500, but it has eliminated an annual expenditure of about $19,000 for round-the-clock security guards. At night three 500-watt floodlights provide good seeing for the camera along the wall. Any tampering with either the camera or the lights immediately becomes evident on the monitor screen. Biggest advantage, Hallamore feels, is that the presence of the TV eye system discourages anybody from trying unauthorized entry.

Source: Mike J. Byrne, Supervisor of Security, Hallamore Electronics Division of The Siegler Corporation, Anaheim, Calif.



TRICKY WELDING JOBS CALL FOR TRICKY METHODS

Two unusual welding jobs taxed the ingenuity of two Michigan companies. But smart ideas paid off.

A "ring of fire" lets The R. C. Mahon Company (Detroit) weld 3-in.-thick chrome-moly steel hubs plus radial vanes to turbine cylinders (left photo). Problem: to maintain a constant 450-deg. temperature to avoid stress cracks. Solution: Mount each 4850-lb. cylinder on a rotating table, then almost surround it with flame. Specially arranged pipes supply a mixture of natural gas and air for preheating while sheet metal hoods help retain heat. Resulting warpage and shrinkage is controlled within 1/16 inch.

At Baker Perkins, Inc. (Saginaw), the problem was balancing the unbalanced. Solution: an old lathe chuck and a variable speed drive. These hold and rotate the assembly (right photo) while operator welds low-carbon steel axles to a 650-lb. S-shaped stainless mixer blade. Positioner enables welder to make deep welds around the 4-in. axle. Pedal controls motion of positioner. Axles are shrink-fitted before welding.

Making Moving Day Easy for Employees

Every company that moves employees—new hires included—benefits by helping them find good housing fast. But it takes management teamwork to make employee moves smooth, get men back to work relaxed and happy. Management has to decide what expenses will be company-paid and when families will hunt for homes. To show how best to aid in this situation, here's some valuable experience that G-E's Rectifier Section got when its plant moved from Lynn, Mass., to Lynchburg, Va.

To start off, GE's management committee established ground rules:

. . . *Every employee scheduled* to move with the plant would spend five days in Lynchburg house hunting with his wife.

. . . *Visits would take place* well in advance of the actual move.

. . . *Everything possible to* make the trip fruitful would be done.

. . . *Employee moves* would receive the same careful attention as physical details of the new building.

Search Schedules—Timing of visits to the new location was based on each employee's transfer date and on his plans to buy, build, or rent. A questionnaire determined these facts in advance. Timing of house-hunting trips allowed roughly four months between visit and actual transfer for those who planned to buy, slightly more lead time for those who planned to build, and less for renters. The schedule kept the total trips during any one week to fewer than six, with only one rental prospect in each group because rentals were scarce. Employees were personally notified of their scheduled dates. Switching was made by mutual consent only.

House-hunting kit—Planning each house-hunting trip was not left to chance—or the employee. Three weeks before he and his wife were scheduled to make their initial visit he got a trip-kit including:

1. A cover letter and index of the kit's content.
2. A "brief" of the services available for house hunting.
3. An outline of house-hunting and moving expenses that would be reimbursed by the company with expense record forms included.
4. Forms and description of housing loans available through the company in the event conventional financing didn't work out.
5. Report on mortgage and home loans in Lynchburg, based on a personal survey conducted by the section's manager of finance.
6. Point-to-point plane and train schedules.
7. Lists of all Lynchburg architects, contractors, financial institutions, realtors, and lawyers.
8. A 15-page booklet, "Buying a Home—How to Go at It."
9. Dimensions of typical pieces of furniture to check space in dwelling under consideration.
10. Table of monthly payments for employee loans of various sizes, rates, and terms.
11. Analysis of home price averages for various income levels. This let each employee see how his plans met the average for his income.
12. Checklists for 50 important considerations in reviewing a home. With this the employee got 16 sheets of squared paper and a ruler for drawing floor plans of the houses.
13. Articles entitled "How to Avoid Pitfalls in Buying Older Homes," "G. I. Housing Loans," "F. H. A. Insured Housing Loans."
14. A Lynchburg attorney's comments on closing and legal costs written especially for the trip-kit.
15. Form for recording all Lynchburg businessmen including realtors, architects, and banks contacted by the employee. After the trip the company housing representative used this form in thanking the businessmen for their help.
16. Appointment request form for setting up appointments before the actual trip.
17. Hotel reservation form and addressed stamped envelopes for mailing all the necessary paperwork to the Lynchburg Housing Office (set up to service employees).

Further planning resulted in a completed credit report form, filled out by the employee and mailed to the Lynchburg credit bureau three weeks before his trip. And a personal discussion between employee and his section manager two weeks before his visit made sure housing plans were well thought through. During this meeting the employee's public relations responsibilities in the new city were discussed.

More information—Still more planning brought a Lynchburg newspaper to each employee every day during the week preceding his housing visit. Also during this last week the employee and his spouse borrowed a copy of the "Lynchburg Housing Brochure." This booklet contained maps; bus schedules for Lynchburg and vicinity; additional information about realtors, builders, architects, etc.; complete data sheets and photographs of all houses in the area then for sale; map references of churches, hospitals, shopping facilities, schools, etc. And to top it off, an article on precautions for safeguarding the employee's present home during his absence.

On arrival in Lynchburg the employee and his wife found a copy of the Lynchburg Sunday paper in their hotel room. First thing Monday morning they started off with a 2½-hour orientation trip. Then they were loaned their final house-hunting kit. Its contents:

- Flashlight
- A 50-ft. steel tape for measuring rooms.
- Maps of surrounding counties.
- Special marked map with plant location, city sections, bus routes.
- Icepick for checking beams in old houses for dry rot or termites.
- An appointment schedule based on requests made three or four weeks in advance.

Nerve center of the operation was the Lynchburg housing office. Set up well in advance, its two-man staff knew every person, place, and ordinance in town connected with housing. One staff man was a former building contractor, the other a personnel man. These men stayed in the background as much as possible, but were available for special help whenever needed. Successful? You should see G-E's stack of testimonial letters from grateful—and happily located—families.

Source: Robert L. Jordan, Manager of Employee and Community Relations, Rectifier Section, Low Voltage Switchgear Department, General Electric Company, Lynchburg, Va.

YOU BE THE ARBITRATOR

THE CASE OF

The Qualified Youngster

Out of the experience of the American Arbitration Association

In the first contract negotiated in a chemical plant, the union tried to get a promotion clause based strictly on seniority. Management balked. The union settled for the use of seniority only when qualifications of employees wanting the promotion were equal. "That's the best we can get now," the union negotiator told the rank and file. "We'll try to obtain a stronger seniority clause in the contract next year."

But before the year was up a dispute arose. The company decided it needed another plumber trainee. After posting the announcement for bids, management gave the job to young John J., who seemed to be the applicant most likely to succeed. But John had less seniority than Sammy Q., who also had applied for the transfer.

The union filed a grievance in behalf of Sammy. "Our contract gives management the right to pick the better of two men even though he doesn't have seniority," conceded the business agent. "But this time we're not talking about a skilled job. On a trainee job no previous skill or experience is needed. Every applicant has equal ability and you've got to go by seniority."

"The two applicants aren't equal in qualifications," answered the personnel manager. "We picked the man who was younger and had more aptitude. Besides, he once worked for another company as a plumber's helper. That in itself makes him better qualified."

Eventually the case went to arbitration. Put yourself in the arbitrator's shoes. How would you rule?

For the actual decision turn to page 120

Booklet Boosts Plant to Community

When employee morale and plant prestige suffer from misinformed community opinion, something has to be done. That was the problem faced recently by Westvaco Chlor-Alkali Division. To tell the neighbors the real plant story, Westvaco plant management published a 28-page booklet, distributed it generally throughout the South Charleston (W. Va.) area. Estimated cost was about $7000 for preparation—65¢ per copy for printing in four colors.

Westvaco's extra management effort paid extra dividends. The booklet clearly demonstrates that the 20-year-old facility is not as local residents picture it. In fact, the company has modernized and enlarged the plant to make it competitive with the most up-to-date manufacturing facilities in the country. Certain sore points like community sensitivity to industrial air and water contamination are not covered in the booklet. But the implication of a clean, modern manufacturing operation is there in full force.

A local public relations and advertising firm put the booklet together for Westvaco. These people not only had the skill to do a good job, but also pulled other community residents into the project. This gave it a "community project" feel.

Distribution of the booklets covered all the angles. Community officials, professional groups, customers and suppliers received copies. And every request made by an employee to have a booklet sent to a friend or relative was honored.

Source: Neil C. Elphick, Resident Manager, Westvaco Chlor-Alkali Division, Food Machinery and Chemical Corporation, South Charleston, W. Va.

Now—No-Hands Hogshead Handling

Getting bulky hogsheads into curing ovens was always a vexing problem for the Brown & Williamson Tobacco Corporation (Louisville, Ky.). Now the job is streamlined by a recessed lifter specially designed for this application by Colson Corporation (Somerville, Mass.) The lifter can be lowered about 3 inches below floor level to pick up a hogshead, then elevated to the exact level of the curing oven door. With the old method, the big casks were rolled up ramps to the ovens.

Now the large drums of tobacco ride platform trucks right onto the recessed lifter platform. As the platform rises, a retractable plate automatically drops to bridge the gap between lift platform and curing oven. At the proper level a limit switch incorporated into the platform's electrical control circuit stops the lift, enables the elevator operator to transfer the hogshead to the oven. The lift platform is powered by a ½-hp. motor.

JUST LIKE A COLLEGE CAMPUS

But actually it's the beautifully landscaped patio area in the heart of the new plant of the Charles Bruning Company (Mount Prospect, Ill). Adjacent to the cafeteria, this park-like oasis offers an ideal place for employees to relax for a few minutes during the lunch hour. The 300,000-sq.-ft. plant completed earlier this year is located on a 30-acre site and cost roughly $4.6-million. The plant houses the company's general offices as well as its manufacturing operations. And there's plenty of room for future expansion.

No More Pallets Now

Pallets have been modernized out of handling on The Western Pacific Railroad. In their place is a method for stacking and strapping cased and uncased loads—leaving openings for fork truck blades—on a fiberboard sheet with corner protectors. Naturally the size of containers handled governs the load pattern. But here are two examples of how this system works:

• For cased goods (photo) handlers put 85 cases (2040 cans, 2635 pounds) on the fiberboard tray. They arrange cases so they interlock and create a bond. Layers are stacked six high, then secured with steel bands. One layer (about midway up) has only 10 cases. Other layers have 15. Void in this layer provides two holes for fork-lift blades. Materials cost only $1. And there's no pallet repair problem.

• For uncased goods, a total of 235 No. 10 cans weighing 1880 pounds are stacked. A solid fiber base tray with 2-in. flanges supports the 7x5-can pack arrangement while fiberboard trays separate layers. Midway up there are two gaps for lift blades. Metal angles protect top and bottom edges. If necessary, heavy paper can be thrown over the stack and bound by encircling bands. A larger pack with 366 cans (3000 pounds) is also in use.

Source: L. F. Delventhal, Jr., Transportation Engineer, Western Pacific Railroad Company, San Francisco.

Contributions from readers reporting experiences will be welcomed. No need for fancy writing; just a clear, concise statement of facts. If you have photos or drawings, be sure to include. We'll edit for the Case Book. Contributions accepted will be paid for at time of publication. Address: Case Book Editor, FACTORY, 330 West 42nd St., New York 36.

CASE BOOK CAPSULES

Capacitors have broken another heat barrier. Gulton Industries (Metuchen, N. J.) has a new glass-coated ceramic, subminiature line designed to operate at temperatures of 225 C.

Longest belt conveyor in the country will be completed early next year at The Ideal Cement Company (Ada, Okla.). The 5½-mile run will carry crushed limestone, rock, and shale from a quarry in Lawrence to the company's plant.

Bigger self-propelled earth-moving scrapers are now being marketed by R. G. LeTourneau, Inc. (Longview, Tex.). First units will be in the 70- and 125-ton class, have capacities roughly equivalent to 50 and 100 cubic yards.

Console and table models of x-ray diffraction equipment have been announced by RCA's Industrial Electronic Products Division (New York). Should be ideal for making stress analyses of materials too bulky for the lab.

Radioisotope techniques courses, specially designed for industry people, will start on Feb. 9 and Apr. 6, 1959. The Atomic Energy Commission will conduct the six-week courses at the Oak Ridge (Tenn.) Institute of Nuclear Studies.

Liquid nitrogen generator developed by Arthur D. Little, Inc. (Cambridge, Mass.), requires only pushbutton to stop or start. And automatic controls permit extended operation without attention.

On-the-spot testing of ladder rung capacity can be done quickly with a portable dynamometer (W. C. Dillon & Company, Inc., Van Nuys, Calif.) and an inexpensive block and tackle.

X-ray image amplifier for producing radiographs at least 350 times brighter than on a fluorescent screen has been announced by the Rauland Corporation (Cleveland). Use of this device permits viewing of objects in motion.

Parts Go "Boom"

That's literally what happens in the set-up pictured above. The explosive charge wired in place over the die forces a metal blank into the desired shape when it's set off. Explosion takes place at the bottom of a water-filled tank. This concentrates the application of shock waves following a blast and also serves to muffle the sound.

The process has been labeled Dynaforming by engineers at the Fort Worth plant of Convair Division of General Dynamics Corporation. To date, a Convair manufacturing research and development crew has conducted hundreds of tests to determine the exact amount of explosive needed to accomplish a given job on a specific metal. Convair has duplicated almost every operation of the drop hammer, press, brake, and stretch press including stretching, shrinking, bending, shearing, piercing, or the combination of these.

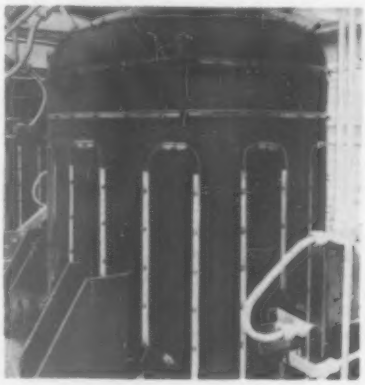
Present tests are designed to extend knowledge gained from wartime explosions of torpedoes and mines. Although still in the experimental and research stage, the explosion technique may be used for production operations at a later date. If it is used on a production basis, savings will result only where cheaper, simplified tooling can be employed, where the number of operations required for orthodox forming can be reduced, where the scrap rate is reduced, or where it eliminates a need for more press capacity.

So far Convair has conducted tests on common aluminum alloys, magnesium, stainless steels, and certain types of steel, copper, and lead. Explosives used include dynamites, gelatins, smokeless powders. Tools have been made of tool steels, mild steel, Kirksite, lead, plastic, clay, and paper.

Committee Audits Shop Safety

New committees spur the safety effort at American Bosch Arma Mississippi Corporation (Columbus, Miss.). The management safety committee is composed of top plant operating men. Production and maintenance employees and staff supervisors make up the shop committee.

The shop committee is the "auditor" of plant safety conditions. Members make regular inspections of the plant, recommend changes to the management committee that are promptly considered. Proof of effectiveness: a top-notch safety record.



This Tank Won't Blow Its Top—Ever

This big tank doesn't ever overheat. The ceramic-embedded, overheat-fire detector tubing around the outside makes sure it doesn't. How? By actuating an alarm whenever heat rises above a predetermined level.

The tubing stands guard over big chemical vats at W. R. Grace & Company's Memphis plant. Strips are made of flexible Iconel tubing that sheaths two wires embedded in ceramic, thermistor core. They come in variable lengths up to 20 feet and are coupled together to form longer runs. Then a 10-volt source is applied to the circuit. Under normal conditions the ceramic offers high resistance to the flow of current between the two conductors. But when temperatures rise, resistance of the ceramic drops rapidly and permits an increased flow of current between the wires. This triggers an alarm to warn of the overheating at a predetermined safety point.

When temperature drops to normal, the alarm automatically shuts off as the resistance of the ceramic increases. The detectors have an alarm range from 200 to 1000 F. Since the units are impervious to oil, dirt, and solvents, they are practically maintenance-free. Walter Kidde & Company (Belleville, N. J.) makes the strip detector.

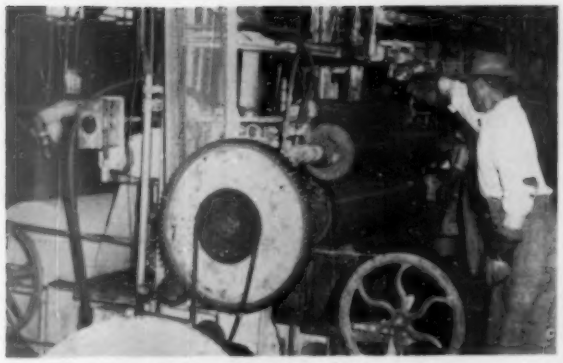
Keeps Air Fog-Free

Semi-automatic mist lubrication was working fine at Line Material Industries (Milwaukee)—except for one thing: Workers didn't like it. Reason: Overspray and drifting mist had machine operators working in a fog.

Line Material engineers solved the problem on a 24-spindle drill by a mist collector (center in photo) with an intake vent extending over the drill table. This vent draws any overspray or drifting mist through a condensing drum, deposits the oil for re-use in a tray placed under the portable collector's carriage. And as a bonus, cutting smoke is exhausted at the same time.

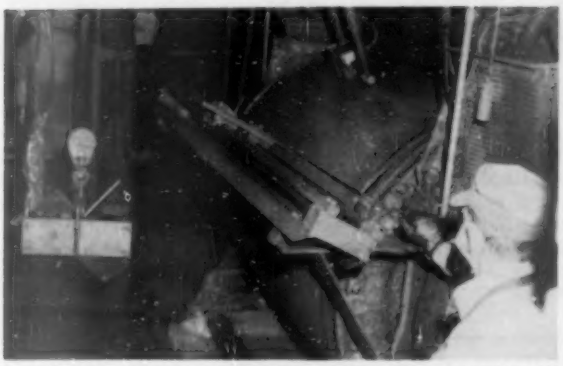
This particular collecting unit cost Line Material $250 to make. It's built around a Mistkop unit consisting of a motor-driven fan and drum-shaped condensing element (Aget Manufacturing Company, Adrian, Mich.). Special ductwork was added to tailor the collector to this application. Placing the entire arrangement on a caster-mounted frame added to its flexibility, enables machine operator to move it out of the way in a few seconds when drill set-up needs changing.

Source: Gordon Melvin, Senior Industrial Engineer, Line Material Industries, McGraw-Edison Company, Milwaukee.



1. ONE MAN DOES WORK OF TWO.

2. AIR CYLINDERS AND CONVEYOR REPLACE MAN.



3. MECHANIZING JOBS LIKE THESE TWO OPERATIONS HELPS CUT 10-MAN CREW TO SIX.

Smaller Machine Crews Pay Off Big

If your company has multi-operator machine operations, crew reduction can be a cost-cutting gold mine. National Vulcanized Fibre Company found this out. NVF makes fibre tubes or shells for a wide variety of end uses. In many cases, crews man one or more machines.

This approach to cost reduction is extra profitable because it offers alternate ways to save money. The first way is to cut the number of people in a machine crew. The second is to increase the productivity of the existing crew by better machine utilization. Naturally this second method can also lead to a reduction in capital investment because it will mean fewer machines are required to obtain a given production quota.

Here are three examples of NVF's approach to cost reduction:

1. Mechanical devices costing $4000 enable one man to tend this machine producing seamless fibre shells. And his output is the same as when two men did the job. What's more, by careful scheduling of relief operators NVF can keep this and similar machines running continuously (and giving up to 30% additional output). Thus savings paid for initial machine modifications in less than four months.

The machine produces shells by winding special rag paper around a collapsible mandrel. Studies showed that all operations performed by the second worker in the original set-up were manual. These included helping thread paper through a coating tank and fastening it to the mandrel. Then when the wind-up was completed, this second man assisted in removing the finished shell.

By moving the coating tank from the floor to directly behind the mandrel and relocating the paper supply roll behind the machine (instead of in front), threading became a one-man job. Similarly, such labor-saving devices as a pushbutton air-operated clutch to collapse and expand the mandrel, a pedal-controlled hydraulic cylinder to retract the outboard bearing, and a level control on the coating tank eliminated the need for the second man during removal of shells.

2. Just $400 for standard skate-wheel conveyor and air cylinders enables one man to chop up as many fibre sheets on this shear as two men used to do. Conveyor and cylinders are located on the other side of the shear. The conveyor supports the sheet while the air cylinders feed it under the shear blade. Formerly a helper performed these functions.

Here's how the new method works: The operator slides a sheet from the stack in front of the shear and under the blade so it rests on the conveyor. After positioning the sheet on a front gage he trips the shear with a pedal, then stacks the cut piece. When a second pedal is depressed, the air cylinders feed the remainder of the sheet under the blade for the next cut.

3. Better methods costing $10,000 at four fibre-sheet laminating machines cut a 10-man roving crew to

six. Payoff of improvements came in less than eight months. And during this same period machine utilization jumped 50%.

Function of this roving crew is to start up, supervise, and remove finished fibre in thicknesses from ¼ to 4¼ inches from machines. Formerly single operations during removal of fibre from one machine required as many as five men. At the same time another of the three machines might be needlessly idle. Now most critical operations can be done by two men at most. And in the majority of instances one man is sufficient. Furthermore, now there's little idle machine time.

Here are a few examples of improvements made at the four fibre laminating machines:

- A knife driven by a hydraulic cylinder cuts fibre from each wind-up drum (lower left photo, p. 117). Holder and guide insure a straight cut while a single worker controls the operation with a valve. The old method required five men to cut the fibre free with a hydraulically powered knife.
- Using a 2000-lb. electric hoist with a tractor hooked in tandem, one operator now removes a heavy, bulky sheet from the machine drum and transports it to the next cutting operation. Four men used to perform this task manually.
- A winch-powered knife resembling a scythe (photo, lower right) enables one man to cut sheet in half so it's more manageable. Push-buttons on handle control knife. In the past, as many as four men performed this operation.

Source: E. J. Harris, Industrial Engineer, National Vulcanized Fibre Company, Wilmington, Del.

VANISHING SHELVES DO DOUBLE DUTY

How do you get all the shelf space you need and save floor space at the same time? The Sherwin-Williams Company figured out its own answer at the company's brand-new paint, varnish, and lacquer plant (Garland, Texas). Here nine sliding shelves in two rows store thousands of product samples in a fraction of the space they would normally take. Each 8½-ft.-high shelf is suspended from an overhead trolley that lets worker slide shelves in and out of storage banks easily. Over-all width of the area occupied by the two rows of shelves is 13½ feet. Shelves themselves are 4½-ft. wide and 6 or 12 inches deep.

New Way to Make Zinc Foil

A new, continuous process is turning out zinc as a thin foil on a pilot-plant basis at American Smelting and Refining Company's research center (South Plainfield, N. J.). The 26-in.-wide sheets range from 0.005 to 0.001 inch in thickness.

In the new method, zinc from a zinc sulfate bath is electrolytically deposited on a revolving drum. Then the foil is stripped from the drum in a continuous sheet of uniform thickness. This process is said to be more economical than the older, conventional metal-rolling techniques. And it produces foil of high chemical purity with great ductility and tensile strength.

Hurries Chips on Their Way

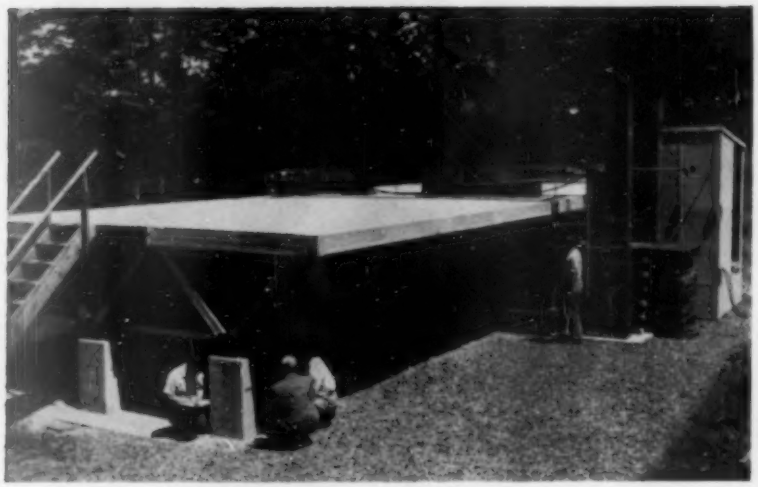
Scrap piles up in a hurry at Boeing Airplane Company's Wichita (Kan.) plant. But not fast enough to cause this big sluiceway (right in photo) any trouble in disposing of it. After metal chips from machining and finishing operations are deposited in trough, water propels them to a central collection building.

The sluiceway takes care of 12 tons of scrap each day. Without disturbing the above-ground operations, Boeing engineers installed the new system in an underground tunnel. Tunnel is made of 7-gage linear plates (Armco Drainage & Metal Products, Inc., Middletown, Ohio), has a 96-in. diameter, and is 292 feet long. Pipes on left return the circulating water.

Aluminum Conduit Trims Maintenance

If your plant is located where the climate is warm and humid, you may want to investigate the use of aluminum conduits for process-water cooling towers. It could result in the prevention of corrosion and virtual elimination of costly, time-consuming maintenance. After almost two years of service, aluminum conduit installed at Celanese Corporation of America's petrochemical plant (Bishop, Tex.) shows no signs of corrosion. Requires no painting, taping, replacing, or repairs. And all switches still work freely.

Aluminum conduit withstood cor-



LATEST WORD IN BRIDGE DESIGN

Here's a cheap, light, easy-to-maintain structure that may help you solve a bridge problem in your plant. It could be used to connect buildings or for overpasses. Structure is called the Fairchild Aluminum Bridge (Fairchild Engine & Airplane Corporation, Hagerstown, Md.). Its design permits economical mass production and factory assembly of major parts. Also light weight of aluminum makes hauling from factory to bridge site practical and economical. During tests at Lehigh University, five men (including a crane operator) in two days erected a span, excluding preparation of abutments and hardening of roadbed.

rosion from the Gulf Coast climate as well as from plant fumes and cooling-tower vapors. In the production of acetic acid, methanol, acetone, formaldehyde, and paraformaldehyde, the plant requires a circulation of 175,000 gpm. of process cooling water cooled in six induced-draft cooling towers. Electric motors totaling 2110 hp. and ranging in size from 25 to 60 hp. drive the cooling fans. Before the aluminum conduits were installed, corrosion of power and lighting conduit, receptacles, lighting fixtures, and motor start-stop stations on cooling towers had always been an expensive maintenance problem.

Tests on aluminum conduit started at the plant in the spring of 1956. Installation began six months later. Aluminum cost roughly 19% more and fittings about 8% more. But because aluminum is easy to handle and bend, electricians completed the installation faster.

Reprints of the Plant Operating Case Book are available. Price 50¢. For quantity prices write Reader Service Department, FACTORY, 330 W. 42nd St., New York 36.

Cool Sinter on the Double

This circular unit air-cools hot sinter from 1300 F. to 200 F. in less than 30 minutes. The first of its kind in this country, the giant cooler (it measures 65 feet in diameter) is installed at the Cleveland Works of Jones & Laughlin Steel Corporation.

Over 450,000 cfm. of air brings about the sharp temperature reduction. Air moves up through the hot sinter as it travels around the 205-ft. circumference of the cooler on 7x5½-ft. trays. It's exhausted by a 16-ft. diameter, 100-ft.-high central stack. After cooling, rubber convoy belt transports sinter to blast furnaces or storage areas.

As the fused material leaves the sintering machine it's broken into lumps that fall on an oscillating screen. This removes small particles and dust. Use of air in this cooler (Dravo Corporation, Pittsburgh) eliminates use of water for cooling. Also saves space by eliminating large storage area to spread material out for cooling.

Not Too Hot or Cold

No hot-again-cold-again water problem here. The man washing rouge from this camera lens at Argus Cameras (Ann Arbor, Mich.), knows the water is going to be just the right temperature. A thermostatic control called Hydroguard solves the troublesome temperature problem at Argus's 14 rinsing sinks.

Warm water between 120 and 140 F. is essential to remove all traces of the polishing rouge. To obtain this temperature mix the 14 rinsing sinks draw 180 F. water from a recirculating water line, combine it with city water at 50 F. to provide a 10-gpm. supply to the rinsing sinks.

Once Hydroguard (Powers Regulator Company, Skokie, Ill.) is set for the desired temperature, the polisher is assured of getting it every time, regardless of fluctuations in hot- or cold-water lines. A thermostatic element automatically compensates for fluctuations to maintain an even water temperature. Before this control was installed worker obtained the required temperature by adjusting two hand valves.

Roller Skids Make Moves Easy

Ever have to move heavy assemblies through an area with no overhead crane? Workers at General Electric's Lynchburg (Va.), plant move big rectifiers easily with small roller skids resembling miniature army tanks. Called "Multitons" (Stokvis-Edera & Company, Port Washington, N. Y.), these units can be used by the maintenance department for moving machinery, too.

Rectifiers up to 7 feet tall (and just as long) move through the plant from assembly to test to shipping on these express rollers. In a typical job one Multiton supports the rectifier's wooden pallet at each of its corners. Sharp projections extending from the top of a unit's swivel plate bite into the wood to secure the loaded pallet. Thus pallets can be pushed or pulled by hand or with a truck in a straight line or around corners.

Source: H. E. Mungan, Manager —Plant Facilities, Rectifier Section, Low Voltage Switchgear Department, General Electric Company, Lynchburg, Va.

Color Makes the Difference

Using photographic film to detect surface defects isn't new. But adding a bit of color gives better results, say engineers at Westinghouse Electric Corporation's electronic tube plant (Elmira, N. Y.). Here they're using this technique to inspect TV camera tube parts.

A bichromate or chromic acid stain on a clean metallic surface, for example, is hardly detectable to an experienced eye after washing. Yet this same stain shows up plainly on a photographic negative when a proper blue filter and panchromatic film are used. Westinghouse uses this technique to tighten up process control. Especially where obscure sources of contamination could interfere with critical product quality.

Updates Tool Crib the Easy Way

How long since you've given your toolcrib a good housecleaning? Well, here's an idea for when you do. Use your regular checkout procedure to advantage. That's how the job was done at Van Norman Machine Company (Springfield, Mass.) a division of Van Norman Industries.

As a result of toolcrib updating Van Norman reduced the crib area by roughly 40% (from 2800 square feet to 1650) and eliminated 20 to 25% of its obsolete tool inventory. During the changeover there was no interruption in normal operating procedure. Actually the move was a by-product of new layout plans. Floor space occupied by the crib was slated for other use. But rather than move all tools to another location, Van Norman decided this was the time to update the 40,000 to 50,000 tools, jigs, and fixtures that had accumulated over the years.

Having operators check tools out of the old crib and return them to the new one solved the transfer problem. And at the same time it was soon evident which tools were in present demand. In three months 40% of the tools had been moved.

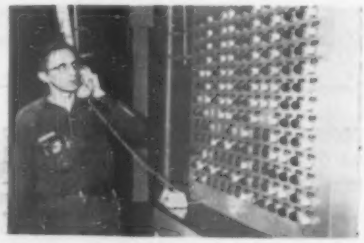
The remainder were compacted at the old location and left unattended for an additional six months. At the end of this period tools still remaining in the old crib were checked carefully for usefulness, then scrapped. Van Norman uses the same control system for tools in the new crib as it did at the old.

YOU BE THE ARBITRATOR

Continued from page 114

The award—Key word in the promotion clause, the arbitrator said, was "qualifications." This means not just skill and experience, but also other factors such as aptitude, age, adaptability, etc. That the man who got the job had previous experience in related work made his claim on the basis of "qualifications" even stronger. The company was therefore upheld.

Caution: The award in this case is not an indication of how other arbitrators might rule in other apparently similar cases. Arbitrators do not follow precedents. Each case is decided on the basis of the particular history, contract, testimony, and other facts involved.



Keeps Set-Up Man, Operator in Touch

This communication arrangement saves precious operating minutes on a 32-station NATCO automatic transfer machine at the new Lima (Ohio) engine plant of Ford Motor Company. Telephone connects operator's pulpit to any of 16 plug-in stations for the set-up man's use. And the idea is not restricted to new machines. It can be readily adapted to machines already in service.

The telephone is not in constant use. It's installed primarily to help make tool changes easier and faster. While the operator can cut out any of the 32 stations on the 68-ft.-long machine from his control pulpit, he must tell the set-up man what tools to change.

The giant transfer machine performs 13 separate machining operations per hour on 230 Lincoln, Mercury, or Edsel front engine covers. Also handles a mix of conventional or power steering covers.

Break this seal

FROM THE CASE OF YOUR
A. O. SMITH MOTOR MAN

First major breakthrough in fractional hp motor design...

revolutionary new

...for switch, actuator, capacitor, thermostat and terminal board

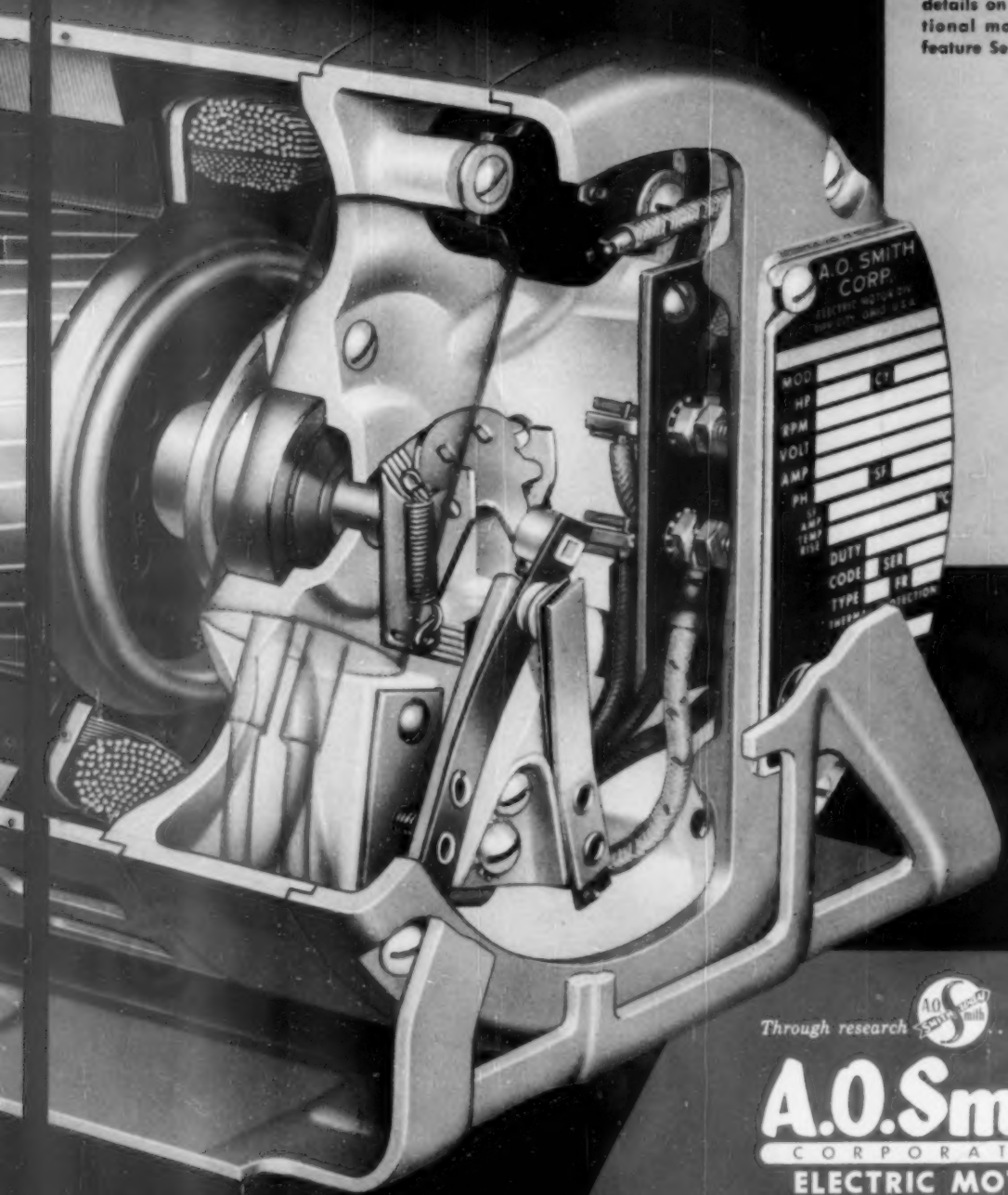
1. Seals out dirt, lint, insects and other matter. Ventilating air *cannot* contaminate these vital parts.
2. Provides complete protection against mechanical damage.
3. Sealed capacitor and terminal board assures easy, all-position mounting. Absence of externally mounted capacitor* "dog house" and conduit box permits installation anywhere and in any position.
4. Bearings are prelubricated and sealed. Require *no* lubrication for the life of the motor.
5. Finally... ball bearing motors as quiet as sleeve bearing motors.
   - **A.** No more "book-end" bearings. New design permits much closer bearing centers.
   - **B.** Super-honed close tolerance bearings.
   - **C.** Magnetic noises reduced to absolute minimum by special machining and assembly processes.
   - **D.** Air noise practically eliminated through unique ventilation design.
6. Single phase motors with the new sealed starting switch are available from ⅓ to 5 hp. Included are specific designs for blowers, pumps, compressors, machine tools, and material handling equipment.

Adjustable starting switch

Every A. O. Smith single-phase motor features the new *exclusive* adjustable starting switch. The vital switching action is no longer dependent on a build-up of tolerances throughout the motor. On *every* motor the switch is adjusted *after assembly* by turning the self-locking screw (A) to achieve a preset clearance between the switch button and the actuator. This setting assures proper contact alignment and positive switching action... guaranteeing maximum life for *every* motor. Field adjustments and/or replacements are just as easy.

*Capacitor is internally mounted on motors rated 1 hp, 3600 rpm and ¾ hp, 1800 rpm and smaller.

sealed capsule



Please send me more comprehensive details on the A. O. Smith line of fractional motors — ½ to 2 hp — that feature Sealed Capsule design.

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FIRM .....

TITLE .....

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CITY ..... ZONE ..... STATE .....

Rigid or resilient base models available.

Through research A.O. Smith *... a better way*

A.O.Smith

CORPORATION

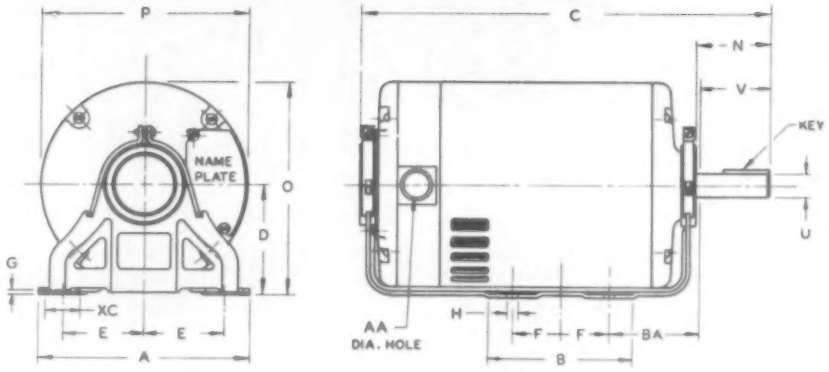
ELECTRIC MOTORS

531 North 4th Street

TIPP CITY, OHIO

NEW...
"SEALED CAPSULE"
FRACTIONALS

RIGID AND RESILIENT BASE



FRAME SIZE	DIMENSIONS IN INCHES										
	A	rigid B	resilient B	C	D	E	F	G	H	N	O
56-1	6½	4¾	4	11 3/16	3½	2 7/16	1½	5/32	11/32	1 15/16	6 11/16
56-2	6½	4¾	4	12 3/16	3½	2 7/16	1½	5/32	11/32	1 15/16	6 11/16
56-3	6½	4¾	4	12 11/16	3½	2 7/16	1½	5/32	11/32	1 15/16	6 11/16
56-4	6½	4¾	4	13 3/16	3½	2 7/16	1½	5/32	11/32	1 15/16	6 11/16
56-5	6½	4¾	4	14 7/16	3½	2 7/16	1½	5/32	11/32	2 5/16	6 11/16
56-6	6½	4¾	4	15 1/16	3½	2 7/16	1½	5/32	11/32	2 5/16	6 11/16

FRAME SIZE	DIMENSIONS IN INCHES						
	P	U	V	AA	BA	XC	KEY
56-1	6 3/8	5/8	1¾	.859 .864	2¾	1 7/32	3/16 x 3/16 x 1 3/8
56-2	6 3/8	5/8	1¾	.859 .864	2¾	1 7/32	3/16 x 3/16 x 1 3/8
56-3	6 3/8	5/8	1¾	.859 .864	2¾	1 7/32	3/16 x 3/16 x 1 3/8
56-4	6 3/8	5/8	1¾	.859 .864	2¾	1 7/32	3/16 x 3/16 x 1 3/8
56-5	6 3/8	¾	2¼	.859 .864	2¾	1 7/32	3/16 x 3/16 x 1 7/8
56-6	6 3/8	¾	2¼	.859 .864	2¾	1 7/32	3/16 x 3/16 x 1 7/8

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BLOWER MOTORS RESILIENT BASE

HORSEPOWER	1/3	1/3	½	½	¾	¾	1	1	1½	2
R.P.M.	3600	1800	3600	1800	3600	1800	3600	1800	3600	3600
FRAME SIZE	56-1	56-1	56-1	56-2	56-2	56-3	56-3	56-5	56-5	56-6

GENERAL PURPOSE RIGID BASE

HORSEPOWER	1/3	1/3	½	½	¾	¾	1
R.P.M.	3600	1800	3600	1800	3600	1800	3600
FRAME SIZE	56-1	56-1	56-1	56-2	56-2	56-3	56-3

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Bulletin MM-165

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Manually, Mechanically, or Electrically Operated

In the combination truck and railroad opening, illustrated below, two Mahon power operated rolling steel doors, with a movable mullion between, solved the problem of an extremely wide opening in which the entire width was required only occasionally for passage of railroad cars. The railroad spur track entered the building at an acute angle which necessitated an opening 36'-9½" wide for required clearance. It was also necessary to have a truck opening 14'-0" wide at the same location. The door at the left operates individually as the truck opening. When it is necessary to use the entire railroad opening, both doors are opened and the movable mullion is unlocked and moved clear to the right on an overhead track. When you have a special door problem, consult Mahon engineers. When you buy a rolling steel door, check specifications carefully . . . you will find that Mahon Rolling Steel Doors are built better to give better service over a longer period of time. See Sweet's Files for complete information including Specifications, or write for Catalogue G-59.

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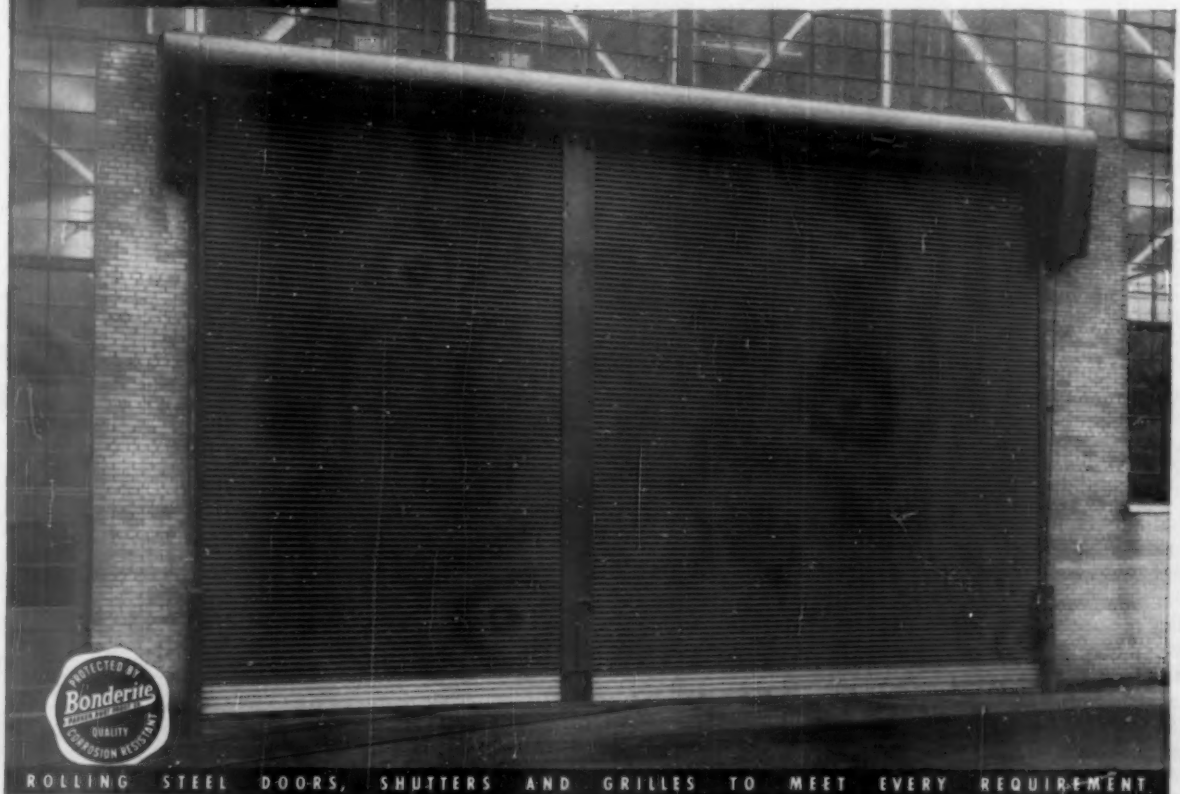
Manufacturers of Rolling Steel Doors, Grilles, and Automatic Underwriters' Labeled Rolling Steel Fire Doors and Fire Shutters; Underwriters' Rated Metalclad Fire Walls, Insulated Metal Curtain Walls, Electrified M-Floors, Acoustical and Troffer Forms, Acoustical Metal Ceilings, Steel Roof Decks, and Long Span M-Decks.



ROLLING STEEL DOORS, SHUTTERS AND GRILLES TO MEET EVERY REQUIREMENT

Two Mahon Power Operated Rolling Steel Doors, with movable mullion between, installed in a combination truck and railroad opening 36'-9½" x 23'-0" in the Fitzsimmons Manufacturing Company's Plant, Detroit, Michigan. Barton-Malow Co., General Contractors.

MAHON

For more facts Circle 518 on Reader Service Card

For more facts Circle 519 on Reader Service Card

"I have yet to find a maintenance storeroom where economies from 10% to 50% weren't possible," says author T. R. Wolf (photo).

Here's how you—yes, you—can . . .

Hit Waste in Maintenance Stores

THERE'S REAL GOLD tucked away in your maintenance storeroom. In two places. Either money you're sinking in poorly managed, excessive inventory. Or money wasted in man-hours—production and maintenance—because of inefficient storeroom facilities.

Not so in your plant? Don't go away yet—maybe this next observation will hit closer home. I have yet to find a maintenance storeroom where economies from 10% to over 50% weren't possible.

One aspect of storekeeping always used to surprise me—until I got used to it. That's the number of times top management will insist its store records are good, only to find they're terrible. A controller's interest may be just to know every month how much money is tied up in various groups: $11,000 in valves, $84,000 in spare parts, $7800 in general supplies, and so on. He doesn't know it may take the storekeeper 20 minutes to lay his hands on a deckle strap for the Fourdrinier section on No. 4 machine—or 14 minutes to locate a Fafnir 309 K bearing with a wide inner ring. The mill manager may not know he has enough varnished No. 12 cambric building wire to last 8½ years.

A mill manager in Virginia told me his storekeeping must be in good shape because he had all the things I recommended: code, groups, standard nomenclature, catalog, and records. He had them all, all right, but most of them were as obsolete as the bow and arrow would be in our modern missiles arsenal.

The higher the executive is in the company, the farther he is from the firing line. If he gets close enough to his storekeeper to see the whites of his eyes he may be in for a real surprise—discover an area where he can save his company thousands of dollars every year.

FINDING WHERE YOU STAND

Here are four simple tests:

1. Stockouts—How many shortages do you average in one week, one month? What was their cost in machine downtime last month, previous month?

2. Waiting time—How long do maintenance men have to wait at the storeroom counter? What does this add up to in cost of lost time (at skilled labor rates) per week?

3. Slow-moving items—Do your records disclose these easily? How many spare parts are held as "protective" insurance against breakdowns? How many other items are dead or obsolete? How many haven't moved for 1 year, 2 years, 5 years?

4. Periodic reports—Do you know the total dollar value of your maintenance stores each month? And is it broken down into enough groups so that you can tell where the changes occur and which type of stock may be getting out of bounds?

First two tests deal with penalties of inadequate stock and poor facilities. Last two point to dollars wasted by poor control. No one will ever honestly dispute the need for a storeroom. The problem is just where to draw the line on size of inventory and extent of service facilities and personnel. It's basically the problem of finding a balance between cost of having good storeroom procedures and cost of not having them. It's a case of keeping inventory at a minimum to save in dollar inventory and

By T. R. WOLF, Maintenance Consultant
Ridgewood, N. J.

cost of space. And it's a job of controlling inventory to make sure you have enough, yet not too much, of the right materials on hand.

WHAT INVENTORY COSTS

How much money can a company save by cutting surplus inventory?

The "cost of inventory possession" is variously estimated by reliable authorities at anywhere from 15 to 30% per year. This includes primarily interest, obsolescence, deterioration, handling, and loss due to inability to take advantage of other profit-making ventures.

Let's take 20% per year as a conservative figure. And let's say that yours is one of thousands of companies that can reduce total inventory—safely—by at least 15%. Then your savings might look like those in the table (right, above).

I am talking here of actual inventory, not just book inventory. Many companies charge out materials when received, even though not yet used. Such items often run more than half the total inventory.

The manager of a large pharmaceutical plant (3500 employees), for instance, tells me that storekeeping is a minor problem with his company because it has only 7000 items in the storeroom, worth about $250,000. Actually, it has some 18,500 items (worth no-one-knows-how-much), counting parts kept in the instrument shop (over 4000 different kinds), electric shop and garage, and spare parts in each production area. You can imagine the deterioration, obsolescence, and duplication involved in this "minor problem." On bearings alone the company found over 250 defective ones, 300 obsolete or surplus, and an acute shortage of others.

WRONG-WAY CONTROL

Many companies solve the inventory problem simply by slashing inventories across the board. This is often the wrong way. There are companies that would actually save money by increasing their stores on some items to avoid a costly shutdown. A mill in Georgia, for example, boosted its inventory on five large, critically located bearings by $5000. But other bearings were cut $9000 for an immediate net reduction of $4000. Further savings in downtime are due when the critical bearings are needed.

How do you go about reducing inventory? The manager of one mill used to slash each requisition in half whenever the head office put on an economy drive. Result? Serious shortages—until his storekeeper and supervisors began to requisition twice as much as they needed. Another plant manager issued orders to cut inventory 20%. This popular approach has been known to shut down equipment, a process, or even a plant. The inventory is too low on some items, still too high on others, and it soon builds up again when the pressure is eased.

How Lower Inventory Saves Money

If inventory is worth . . .	. . . and you cut it . . .	. . . you'll save 20% a year . . .	. . . or this much a month
$ 100,000	$ 15,000	$ 3,000	$ 250
300,000	45,000	9,000	750
500,000	75,000	15,000	1,250
1,000,000	150,000	30,000	2,500
5,000,000	750,000	150,000	12,500

Six Keys to Managing Inventory

The only permanent solution is to adopt a sound program, so that inventory decisions are not arbitrary but based on factual data. Whoever is responsible for stores—and someone should be—must have certain tools to work with. He needs these six tools to do a good job:

1. Up-to-date catalog—Lists every item carried in stock. Gives a quick, over-all picture of what's available. Is so simple in form that anyone—store clerk, craftsman, maintenance manager, department heads, controller—can find any item in a few seconds.

2. Workable numerical code—So designed that every item listed in code number sequence will also be in alphabetical or numerical sequence. A permanent code, yet flexible enough to assign each new item for years to come to its alphabetical or numerical niche.

3. Orderly item grouping—Provides clean-cut categories for all items, subdivided into logical subgroups. Arranges both groups alphabetically or numerically for easy recognition in a reference index.

4. Standard nomenclature—Describes each item with a minimum of words and a maximum of clarity. Causes like items to be so grouped that any duplication is obvious.

5. Adequate records—Provide whatever history is needed for control of every item.

6. Adequate physical facilities—Provide safe storage of every item, free from damage or deterioration, and permit easy location and speedy removal of stock.

Let's elaborate on these, taking them in reverse order, because that's the way most people will best understand their development.

1. GOOD FACILITIES

The ideal maintenance storeroom would be centrally located, with maintenance shops adjacent. It would be large enough to hold everything—with room for expansion. Bins would be the right size, easily adjustable in height and especially in width. Bin depth would vary with type of contents. Bin structures would not tower so high as to require ladders (or monkeys), and there would be vacant spaces for additions. Aisles would be neither too wide nor too narrow. You wouldn't need wide aisles for bolt bins, but for pump parts you might need room for a lift truck.

The room would be well lighted. Latest I.E.S. standards (updated after recent Blackwell report—see "Now Lighting Standards Soar to a New High," September FACTORY) recommend at least 10 foot-candles (at object height) in bulk storage areas, 20 for medium-sized parts, 50 for fine parts. Flashlights are

Ideal stores catalog will have: 1. General index

General

01 Abrasives
02 Air Conditioning
03 Automotive
04
05 Bearings – Anti-Friction
06 Bearing Accessories
07 Belting

Valves & Piping

50 Pipe
51 Pipe Fittings
52 " " Weld
53 Plumbing & Heating
54 Tubing & Fittings
55
56 Valves

Electric

21 Insulation
22 Instruments & Parts
23
24 Lubricants
25 Metals – Bushing Stock

60 Brushes
61
62 Coils
63 Conduit & Fittings
64 D-C Motors

36 Pump Parts
37 " "
38
39 Refractory Materials
40
41 Supplies
42
43 Tools
44 Transmission Equipment

Spare Parts

93
94 Paper Machines
95 Power – Electric
96 " – Steam

Other Material

97 Rebuilt Items
98
99 Obsolete

okay for searching but not for groping through aisles and corners. Good ventilation, with clean, comfortable air, helps preserve stock and men's tempers. Some southern mills can get awfully hot and humid—a few are fully air-conditioned.

This ideal storeroom would also have good receiving and shipping facilities—space to check incoming materials, accumulate major-project items, and prepare shipments for outside repair, reconditioning, or return. Total area would be big enough for efficient layout of all stores. Stock would be grouped with like items together; with fast-moving pieces near the counter; slow-moving out of the way.

I have found that such storerooms are few and far between. When a company has money to spend, production most often gets first crack at it. Which usually is as it should be. But a storeroom that fails to keep up with an expanding plant can be an expensive bottleneck.

Cases in point—A plant in Ohio moved into its present storeroom 30 years ago. It was adequate for a good many years despite company growth. But in the last five years further growth—coupled with the increasing complexity of equipment—necessitated the stocking of 30% more items than had been needed previously. Many of these new articles were placed in 38 separate caches scattered around the property. Hundreds of man-hours are being wasted each year by high-priced maintenance men who have

...2. Subgroup

50 PIPE

10 Pipe Black
11 " " XH
15 " Brass
16 " " XH
20 " Copper
25 " Concrete
35 " Electroclad
45 " Galvanized
46 " " XH
55 " Lead
65 " Plastic
75 " Soil
85 " Stainless Steel
99 One-Time Material

ABBREVIATIONS:

GALV – Galvanized
S HUB – Single Hub
SS – Stainless Steel
XH – Extra Heavy
XXH – Double Extra Heavy
XXXH – Triple Extra Heavy

...3. Detailed catalog page

Code Number		Description				Unit of Issue	Unit Price	Bin No.
10	001	Pipe	Black		1/8	Ft.	xx	xx
	002	Pipe	Black		1/4	Ft.	xx	xx
	003	Pipe	Black		3/8	Ft.	xx	xx
	004	Pipe	Black		1/2	Ft.	xx	xx
	005	Pipe	Black		3/4	Ft.	xx	xx
	006	Pipe	Black		1	Ft.	xx	xx
	007	Pipe	Black		1 1/4	Ft.	xx	xx
	008	Pipe	Black		1 1/2	Ft.	xx	xx
	009	Pipe	Black		2	Ft.	xx	xx
	010	Pipe	Black		2 1/2	Ft.	xx	xx
	011	Pipe	Black		3	Ft.	xx	xx
	012	Pipe	Black		3 1/2	Ft.	xx	xx
	013	Pipe	Black		4	Ft.	xx	xx
	014	Pipe	Black		5	Ft.	xx	xx
	015	Pipe	Black		6	Ft.	xx	xx
	016	Pipe	Black		8	Ft.	xx	xx
	017	Pipe	Black		10	Ft.	xx	xx
	018	Pipe	Black		12	Ft.	xx	xx
	019	Pipe	Black		14	Ft.	xx	xx
	020	Pipe	Black		16	Ft.	xx	xx
	022	Pipe	Black		20	Ft.	xx	xx
	023	Pipe	Black		24	Ft.	xx	xx
	024	Pipe	Black		30	Ft.	xx	xx
11	001	Pipe	Black	xh	1/8	Ft.	xx	xx
	002	Pipe	Black	xh	1/4	Ft.	xx	xx
	003	Pipe	Black	xh	3/8	Ft.	xx	xx
	004	Pipe	Black	xh	1/2	Ft.	xx	xx
	005	Pipe	Black	xh	3/4	Ft.	xx	xx
	006	Pipe	Black	xh	1	Ft.	xx	xx
	007	Pipe	Black	xh	1 1/4	Ft.	xx	xx
	008	Pipe	Black	xh	1 1/2	Ft.	xx	xx
	009	Pipe	Black	xh	2	Ft.	xx	xx
	010	Pipe	Black	xh	2 1/2	Ft.	xx	xx
	011	Pipe	Black	xh	3	Ft.	xx	xx
	013	Pipe	Black	xh	4	Ft.	xx	xx
	015	Pipe	Black	xh	6	Ft.	xx	xx
	016	Pipe	Black	xh	8	Ft.	xx	xx
	017	Pipe	Black	xh	10	Ft.	xx	xx
	018	Pipe	Black	xh	12	Ft.	xx	xx
	019	Pipe	Black	xh	14	Ft.	xx	xx
	111	Pipe	Black	xxh	3	Ft.	xx	xx
	117	Pipe	Black	xxh	10	Ft.	xx	xx
	211	Pipe	Black	xxxh	3	Ft.	xx	xx
16	003	Pipe	Brass	xh	3/8	Ft.	xx	xx
	005	Pipe	Brass	xh	3/4	Ft.	xx	xx
20	015	Pipe	Copper		6	Ft.	xx	xx
25	018	Pipe	Concrete		12	Ft.	xx	xx
	021	Pipe	Concrete		18	Ft.	xx	xx
35	011	Pipe	Electroclad		3	Ft.	xx	xx
	013	Pipe	Electroclad		4	Ft.	xx	xx
	015	Pipe	Electroclad		6	Ft.	xx	xx
	016	Pipe	Electroclad		8	Ft.	xx	xx

to wait while clerks locate items in a country-store atmosphere. The plant finally saw that wasted time is wasted money. Plans are now under way to build a new storeroom.

It isn't always possible, or even desirable, to build a new storeroom. Usually a lot can be done to make present facilities more efficient. A storeroom in a southern plant found itself over-crowded because most bins were either two or three feet deep exactly. Such expensive space is now being salvaged by "bin shrinking." Sections that used to tower 12 feet in the air are being cut in half in depth and height. It looks as though the 6-ft.-high sections will hold all that the deep 12-ft. ones used to. Store clerks may get fat not having to clamber around like monkeys any more, but a distinct accident hazard is being eliminated. The too-wide aisles are being narrowed, and vertical storage racks are being built to utilize air space formerly wasted in certain areas where merchandise was stored on the floor only.

2. ADEQUATE RECORDS

You'll go far to beat the combination of stock card and traveling requisition when both are updated daily. Stock card can be hand- or machine-posted. Should be one of each for every item in stock.

Stock card—It should include:

. . . *Description of item.* This should be designed for easy identification, not for reordering (which would be done from the traveling requisition). I suggest using two

Begins on page 126

"One clerk can do all reordering from his desk"

descriptions on most items. The first could be the same abbreviated one found in the catalog (and on the bin)—"BRG SKF 6306 Z NR," for instance; the second, a more complete one interpreting the symbols—"Bearing, SKF 6306 Single-Row-Ball, 1 Shield, Snap Ring." Common equivalents might be listed, such as "Fafnir 306 KDG, MRC 306 SFG, New Departure 47606," and so on. And plant equipment that uses this particular bearing might be listed to good advantage, either on the card or somewhere else.

At this point we should make clear we're discussing all kinds of items common to maintenance storerooms. These include maintenance supplies as well as spare parts, and "expense" items as well as those used for "capital" projects. Each plant has to decide for itself what should be made a stores item. This calls for a study beyond the scope of this article, but don't overlook it—it's important.

. . . *Code number.* Stock cards should be filed in code-number sequence. This automatically keeps groups in alphabetical order (as you will see later). Cards are much easier to find by code number than by item description. And since the catalog will always show each code number, you won't need another cross index.

Issues should be posted daily for every item. It's no more work than weekly, which lets you drop 8 to 10 days behind. Thus you may need a larger inventory to cover that lag. Some companies omit this record on fast-moving, inexpensive materials like bolts, reorder them when the bin gets low. Large volume, comparatively little money, they say. But there are hundreds of sizes of bolts and screws, and some are expensive. Many companies find it pays to know when to reorder these on the same basis as the other stock.

. . . *Receipts.* You should post these daily, too, for incoming material.

. . . *On order.* Optional. A lot of companies assume that when an item has reached minimum it's "on order." (In many storerooms this may be an unwarranted assumption.) It's an easy figure to keep when machine posting is used. And it's often helpful to know date and purchase-order number of various transactions.

. . . *Balance on hand.* This is an important figure to be updated daily. When balance on hand reaches or drops below minimum (some plants set a separate reorder point) the item automatically goes on order unless there are special circumstances. This column allows anyone in storeroom to answer quickly any query on number of an item on hand. And it allows one clerk to do all reordering from a desk instead of having several window clerks trying to determine when a dark and distant bin is getting low. Moreover, if business is slow at the window, clerks are apt to work ahead and order too soon. And if they are busy, they may overlook a low item.

. . . *Maximum and minimum.* Sometimes called reorder quantity and reorder point. Also max-min. These are the most important figures in any inventory control program. One company, for instance, has a maximum of 75 and a minimum of 25 on a ½x4-in. machine bolt. This means that when it is down to 25 of that size bolt (balance-on-hand) it orders 50 more (difference between minimum and maximum). Why 75 and 25? Because these bolts come 25 to a box. So when stock is down to one box, the clerk orders two more. Now take that SKF bearing 6306 Z NR—here maximum is 1, minimum O. When the one in stock is used, one more is ordered.

Max-mins can be established accurately for any one item only by a careful study of the history of that item. The factors to take into consideration are usage, delivery time, price, discounts, package units, and cost if the part were not available when needed. The absence of one part might shut down an assembly line worth thousands of dollars an hour in lost time. Yet another part might involve only the slight inconvenience of having to use a longer-size bolt than necessary. A couple of extra $80 valves you could do without would tie up $160 unnecessarily, whereas a surplus of fifteen ½x4-in. machine bolts would cost only 75¢. If it took three months to get delivery of an unusual Timken cone or cup, you obviously would need more on hand than if they were normally available in three days—or three hours in an emergency.

The importance of properly setting—and abiding by—max-mins can scarcely be overestimated. Production and maintenance men—also engineers and storekeepers—naturally tend to play safe. This will cost you money. A survey at a Pennsylvania mill revealed that for years the storekeeper had been ordering 18 brass globe valves (1¼-in.) at a time. Average usage was 8 per year, so 18 was more than a 2-year supply. But he reordered when he got down to about 6, so if the 18 arrived before he used any he had a 3-year supply on hand. At $11.88 apiece he had $285.12 invested. Three valves would be a normal 4-month supply. So if the maximum were 3 and the minimum 2 he would have $35.64 tied up at the most instead of $285.12, thus freeing about $250 to be used where it would do more good.

It will pay you to review your max-min quantities. A medium-sized mill in the Deep South felt quite secure with its maximums and minimums on most items. Antifriction bearings were generally set at 6 and 3 for "small" bearings, 4 and 2 for "medium-sized." Some of these only cost $2 or $3, others $10 to $20. (One cost $4600!) But the mill had 465 different varieties of bearings, and those few extra dollars per bearing mounted up when multiplied by 465. Similar excesses mounted up even more when considered as applying also to the 12,000 items in the rest of the storeroom. The mill got busy on a reappraisal of all max-min figures. Many of those bearings are now set at 1 and 0. When the one on hand is used, one replacement is ordered. This mill is anticipating an inventory cut of about 25%, or around $200,000, plus $40,000 per year "cost of possession" savings.

. . . *Economic lot sizes.* There are a number of "economic order quantity" (EOQ) formulas that are de-

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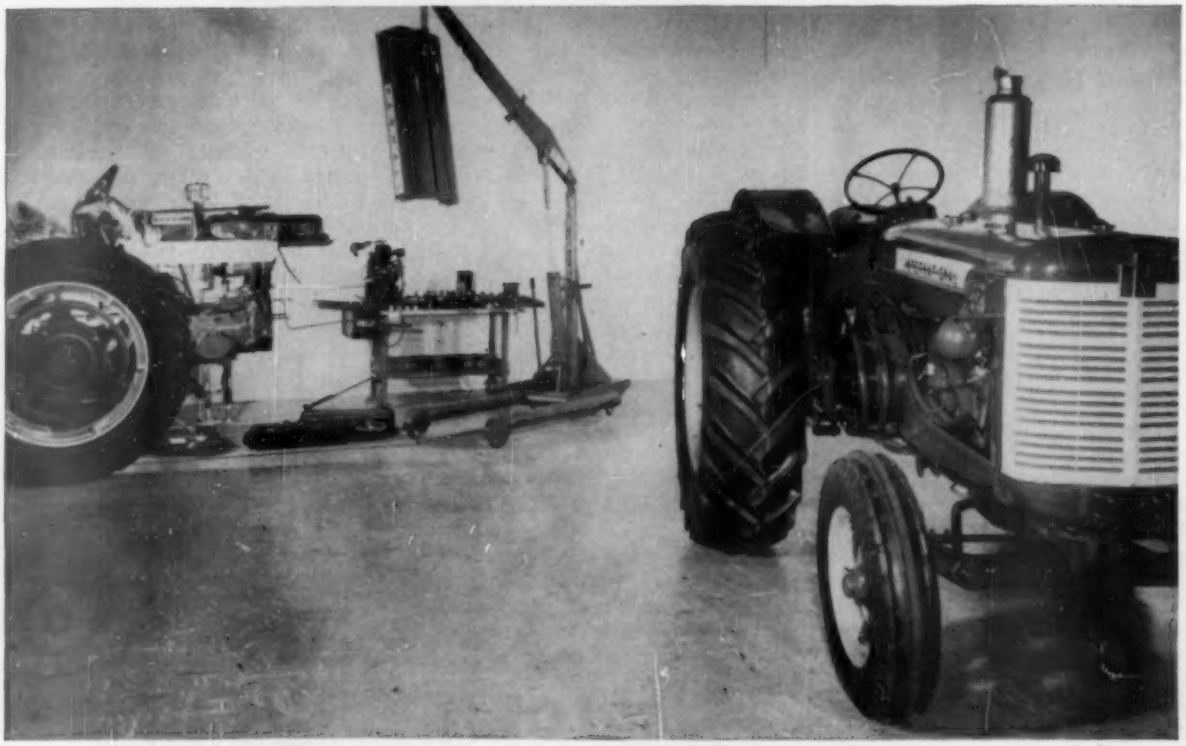

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For more facts Circle 520 on Reader Service Card

Begins on page 126

"I admire the memories of storeroom clerks"

signed as guides in determining how much to order of a given item. They're based on the principle that it costs money to order, receive, and inspect material ($5 to $15 for each purchase order), and to keep material in stock (15% to 30% per year). So the ideal is to balance out between the cost of buying and the cost of possessing. Follow a formula if you wish—as a guide—but if you don't want to be bothered with charts or sliderules, keep in mind that from a purely financial point of view the cheaper an item is, the bigger the quantity you can afford to buy at one time; the more expensive it is, the fewer.

Let me warn you not to apply any EOQ formula blindly—for several reasons. It applies mainly to supplies or spare parts having a large turnover. Also, if EOQ says it's best to buy a year's supply, and the supply will deteriorate, you just don't buy it. Nor do you load up with a mountain of toilet tissue (which shouldn't deteriorate) just because it's cheaper that way—it may penalize you more in high cost of storage space.

Remember, max-min settings usually consider all factors of usage, price, critical importance, and bulk. EOQ considers only usage and price. It's a good idea to check regular purchases with an EOQ formula. But I prefer to work on the customary development of max-min values first rather than second.

. . . *Location guide*. Over the years I have developed admiration for the memories of storeroom clerks. They can lay their hands on hundreds of items with alacrity. But I have yet to find one who can remember the locations of 15,000 items—or 10,000, or even 5000. The stock card should list the location of the material it covers (as should the storekeeper's copy of the catalog). The location may be just the aisle and shelf, or it may be the actual bin.

But unless this system is matched by an orderly array of stock where it belongs, it won't do much good. A good storekeeper will be fussy about "a place for everything and everything in its place." The alternative is what a storekeeper of a Pennsylvania mill has to do. He says 90% of the time he invites the mechanic in to go rummaging through the bins for such things as spare parts, pump parts, electrical and instrument parts. I know other storerooms where maintenance men are not allowed to set foot.

. . . *Unit of issue*. Some materials are bought by the gallon and issued by the pint, some are bought by the pound and issued by the foot. To avoid mistakes in receipts and withdrawals, every receipt should be converted to the unit of issue.

So much for details on the stock card. It can be a Kardex tray-type card or a tub card (such as is put out by VISIrecord and Diebold). It can be hand-posted or, if a tub card, machine-posted. Machine posting is fast, accurate, legible.

The stock-card file should be in the storeroom, not in accounting or purchasing. It will provide the storekeeper with an historical record of every item in stock. It will provide, in conjunction with the traveling requisition, usage and other information that is valuable in setting max-min values and otherwise controlling inventory.

There are companies that operate without such an historical record for each item. I remember two that had only weekly machine-tabulated runs of all items that had any activity on them during the week. So to get the usage, say, on electronic tube No. 6 SQ7 for the past year, one would have to locate that tube on 52 separate weekly runs. The assistant controller was shocked to learn that the storekeeper hadn't even looked at one of the weekly runs for over six months. What else did he expect?

The traveling requisition—It's a very useful tool. It's filed alongside its corresponding stock card, so you have one for each of the several thousand items that are carried in stock. It lists the complete reordering specifications, vendors, code number, maximum and minimum quantities, usage, and reordering and receiving history.

Many companies write a purchase requisition for each article every time they order it. This is sent to the purchasing department, where a purchase order is typed and mailed to the vendor. A traveling requisition eliminates the purchase requisition (hundreds of them every month), saves time and errors.

In one pulp and paper mill the storekeeper spends three-quarters of his time looking up previous purchase orders and writing up purchase requisitions longhand (no typist in the storeroom office). It took me seven minutes to copy the data that he had to write for reordering a thermocouple assembly. To reorder the same part on a traveling requisition took me only seven seconds, or just $\frac{1}{60}$th as long. And all the specifications were there.

When you write or type dozens of purchase requisitions per day there's always a temptation to short-cut the reordering specifications. With a traveling requisition these specifications—sometimes running to 60 or 80 words—are written just once in the storeroom, at the top of the traveling requisition. Purchasing always copies from this description.

Is a traveling requisition practical if the company has central purchasing? Isn't the purchase requisition procedure necessary in this case, for local records? The mill just mentioned sends its purchase requisitions to New York, 250 miles away. If the storekeeper gets $3 an hour, it costs the company about 35¢ for him to write that purchase requisition for a thermocouple assembly just so he can get a carbon copy. The plant has a machine that can make good legible copies of a traveling requisition for only about 8¢ apiece. It should be cheaper as well as more efficient to send this copy to New York.

Usage figures can—and by all means should—be provided on a traveling requisition. And by months, not just yearly totals. An item might show an annual usage of 24—an average of 2 per month. But monthly usage figures might show that whenever any stock is withdrawn it is always 6 at a time (as in a set of V-belts). So your minimum should be at least 6, possibly 12, instead of perhaps 4 or 5—an "average" 60- or 70-day supply.

Turn the page

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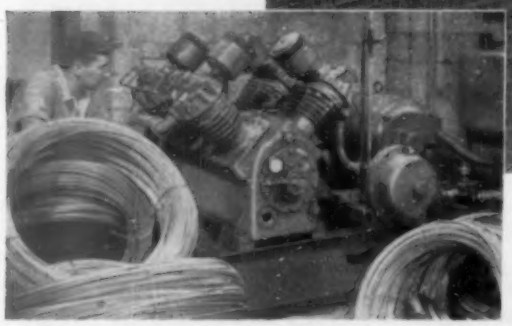

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Ask for a Brunner engineer to analyze your compressed air requirements. He can be mighty helpful in making your operations more efficient.

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Three cases in point—These will show the value of usage figures:

. . . *Paper mill.* In a campaign to cut inventory this plant (600 employees) twice had its foremen review their max-mins, but without usage figures. I went over their 12,000 items a third time with the same foremen—but with usage figures, by months, for the past 20 months. Result? Further reductions of 14% on anti-friction bearings ($4006), 38% on Foxboro instrument parts ($1974), 52% on lubricants ($2171), 66% on parts for one of the Marion cranes out in the woodyard ($5810), and 64% on electric wire ($8056). These figures represent reductions from existing inventory to newly established maximums. Thus average inventories (halfway between new max-min) would be even less (73% reduction instead of 64% on wire, for instance).

In setting these new max-min values nobody's arm got broken—even twisted. It simply became easy for each foreman to determine what his requirements should be when all facts were available. Purchasing told how long it took to get delivery. A bearing distributor reviewed the bearings (at no charge), told us which ones he had in stock, which would take four months to get.

. . . *Pulp mill.* When applied to stores of special Timken cone and cup bearings alone, an assessment of max-min values on a usage basis eliminated over 70% of them by number (67% in dollar value). Rest of the anti-friction bearings were then cut 44% in number, or 30% in dollar value. Both cuts added up to over $18,000 and 1435 fewer bearings.

. . . *Chemical plant.* Spares inventory was cut by some $600,000, largely through deferred purchasing. The plant used to order another pressure vessel, for instance, as soon as the one in stock was put into service. But usage figures revealed that these usually lasted for 8 or 10 years. Now these vessels, costing thousands of dollars each, are ordered after 5 or 6 years.

Good records and simplified paperwork are only one important phase of a low-cost storeroom. The best records are ineffective if you can't quickly find and clearly identify the card for the item you're looking for. You'd be surprised how hard some companies make it to find things. A millwright in Pennsylvania asked a window clerk for a particular anti-friction bearing. No one in the storeroom could find it. So they phoned the accounting department, where the records are kept, to find out where it was supposed to be located. It took the stores clerk a full half hour to learn that the company didn't stock that item. The bearings were grouped in the file, but there were 1020 of them (friction and anti-friction interspersed). The clerk had to scan that many cards to make sure it wasn't listed. The fact that the cards were arranged in a code number sequence was not much help because the code number was a combination of aisle and shelf number. So if you knew the location you could find the card that told you where the item was located.

3. CLEAR NOMENCLATURE

Nomenclature covers not only what you call an item, but how you describe it. A Foxboro instrument in one plant was listed as a "purge unit." The foreman said, "We really should call that a rotometer." Eventually the men got to calling it by its right name—and meanwhile it was cross-referenced.

In this case, as in most others, the misnomer arose out of the tendency for people to describe an item by its function—what it does, rather than what it actually is. "What's the right name?" is the first step in listing items for proper indexing in group classification and correct sequencing in numerical coding (more on this later). Often the clue to the correct name is found in its description.

There's even greater room for improvement in most companies on how to describe an item. A plant in the Midwest had this description on one of its bin fronts:

150MVRGAXI INBOARD OR OUTBOARD

BRONZE CASING RINGS FOR #1½MRV

INGERSOLL-RAND CAMERON TYPE MOTOR

Turn the page

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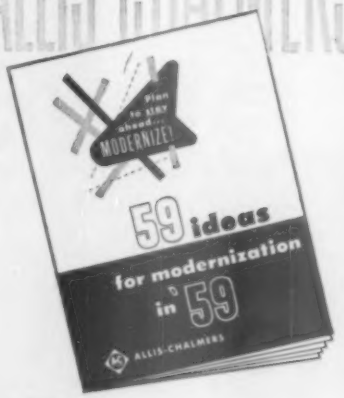

NEW brochure of ideas for modernizing

This booklet is based on the premise that modernization can start anywhere in your plant. It can be a single machine or operation . . . a better way of getting variable speed . . . a faster way to braze . . . or a newly available replacement. In fact, this type of updating is far more common than the sweeping change.

Get a copy of "59 ideas for modernization in '59" from your nearby A-C office or write Allis-Chalmers, Industries Group, Milwaukee 1, Wisconsin.

Examples of updating!

New motor development may eliminate premiums you've been paying for specially protected motors.

Electrical modernization includes placing substations close to machines being served.

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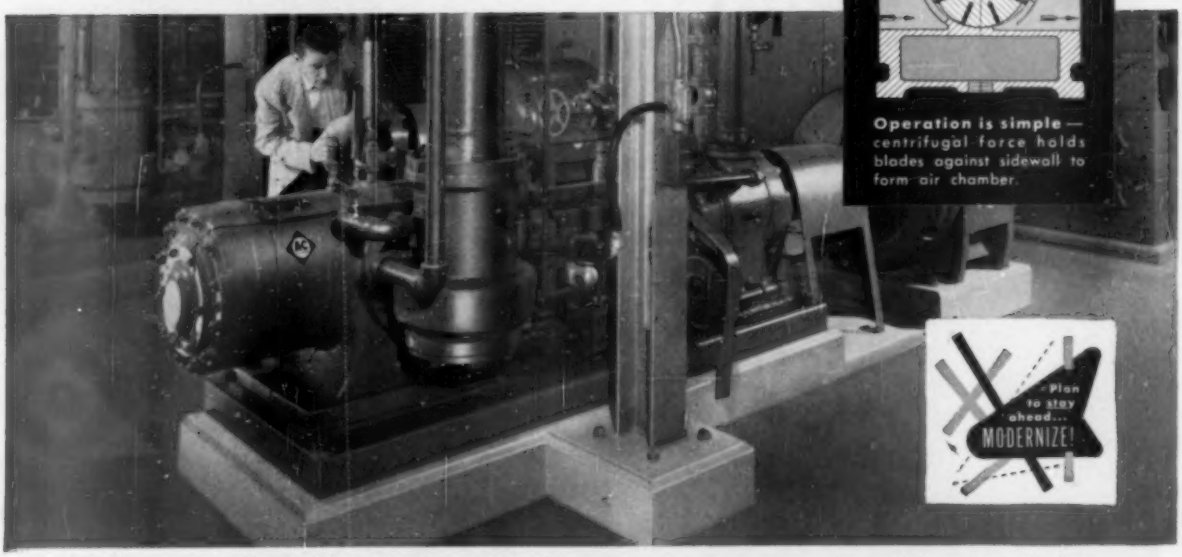
Ro-Flo COMPRESSORS



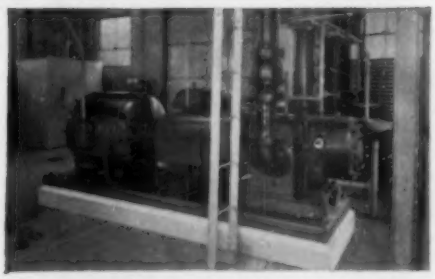
Ro-Flo units at a Midwest utility supply air for mixing with vaporized propane gas to meet an increased demand for natural gas.

No shake...no shimmy...no shock!

Rotary operation produces a remarkably stabilizing effect. You don't get the shimmy and shock inherent in reciprocating compressors.

Users in many industries have discovered that *Ro-Flo* compressors eliminate the cost of heavy foundations. A simple slab is enough. Smaller units are bolted directly to the floor. Automatic wear compensation at the rotor blades keeps compressor efficiency at high level even after years of use. There are only two wearing parts.

Ratings—Choose from twelve sizes of two-stage *Ro-Flo* compressors, ranging from 250 to 1800 cfm at pressures from 60 to 125 pounds gauge. Single-stage *Ro-Flo* units handle pressures up to 50 pounds gauge, and handle volumes from 40 to 3000 cfm.



Two-stage *Ro-Flo* compressor, installed in natural gas pipeline booster station. Unit provides make-up gas to help maintain line pressure for peak loads.

Mobile *Ro-Flo* compressors used on emergency equipment for fighting oil tank fires at a Texas oil storage area.

For complete information on Allis-Chalmers rotary compressors, ask for two-stage Bulletin 16B8244 or single-stage Bulletin 16B8126. Call your nearby A-C office or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wis.

Ro-Flo is an Allis-Chalmers trademark.

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21561 HOOVER ROAD
DETROIT 5, MICHIGAN

HITTING STOREROOM WASTE

Begins on page 126

PUMP USED AS A BOOSTER
UNIT ON #2
MILL SORTING TABLES

All very nice information to have, but a lot of verbiage to wade through by a window clerk when three or four high-priced mechanics are waiting. Perhaps all that's needed on the bin front where the Ingersoll-Rand pump parts are kept is:

RING, CASING, 1½ MRV BRONZE

This reference is a good sample of what standard nomenclature will accomplish in a storeroom. It's a method of refining a description down to its key elements. The rule is simple. List the information in this order: noun, adjective(s), identification. First, what it is you are looking for—in this case, a ring. Second, what type of ring—casing, impeller, oil, or packing. Lastly, the size, serial number, metal, or whatever other pertinent information is required.

4. ORDERLY ITEM GROUPS

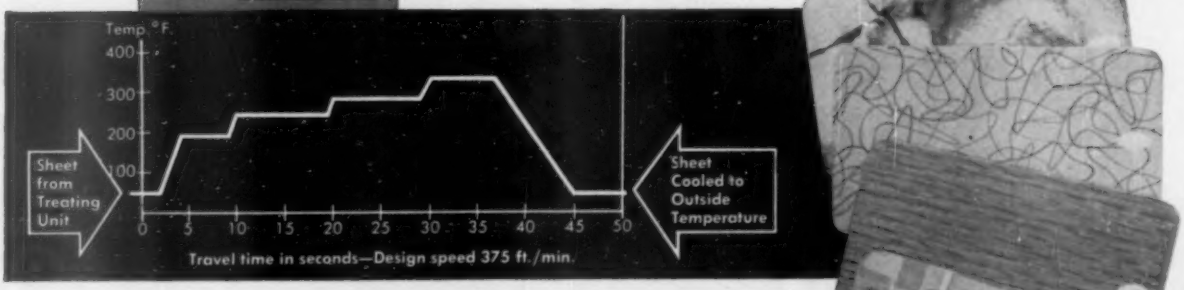
Most companies classify stores stock into logical major groups. The idea is good—it brings together all similar items, helps prevent duplications. And such compartmentalization narrows down the job of identification. But often their logic is rather obscure. Here are some of the groups I have seen:

- Bubble caps, chimneys, tank and tower equipment. (Would you ever think to look for iron pipe here?)
- Miscellaneous: doctor blades, tubing, bearings, pulleys, tires, soap, etc. (What, bearings in with tires and soap?)
- Finished goods, assemblies, supplies. (This is where you would find pump parts, among other things.)
- Electrical supplies. (There are over 3000 electrical items in this storeroom.)
- Rough aluminum castings. (Covers only two items—same storeroom.)
- Mechanical. (Some horse-shoe nails have been sleeping here.)
- General. (This is for everything that doesn't fit anywhere else.)

The number of groups I have run across ranges from 1 up to 140. More often than not they are arranged in such helter-skelter se-

ROSS Air Systems

Engineered Atmospheres for Better Processing



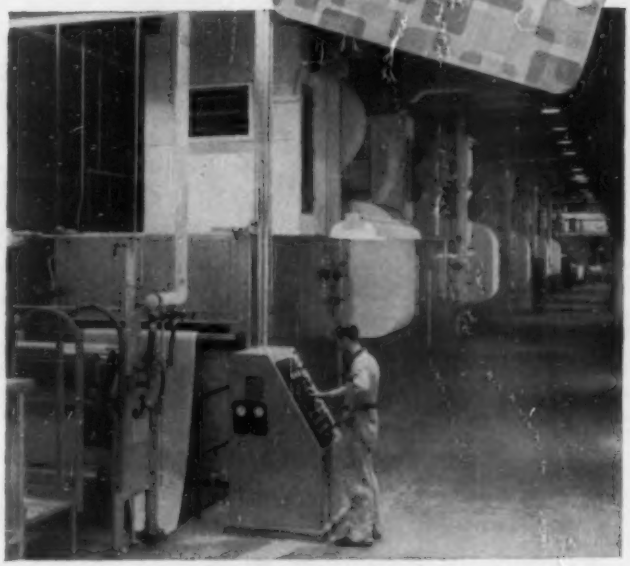
These Temperature Zone PLATEAUS are Critically Important

FORMICA® laminated plastic...long a 'byword' when modernized kitchens are discussed...starts with heavy kraft paper, called Core Stock. But this paper first must be treated properly and then advanced in the oven to insure proper behavior in the final curing process to assure the quality and the durability of the finished products.

The curing of this Core Stock takes place in a large special oven designed and constructed by Ross Engineers. But what takes this operation out of the class of just a routine enclosure with hot air passing through and what puts it definitely in the class of an 'Engineered Atmosphere' is the precise zoning, precise temperature control, and precise circulation of heated air...three steps in the conditioning of the fast moving sheet.

Treated first with phenol-formaldehyde, the kraft paper then passes at a design speed of 375 ft. per minute through a 250 ft. oven (five heating zones and curing plus cooling section) thus heating from 200° F. stepping up to 350° followed by rapid cooling to outside temperature levels. Many engineering problems ...chemical, mechanical, thermal, electrical, instrumentation were involved in the design. All had to be carefully worked out and then integrated to make it a smooth, fast-working, efficient unit.

Further evidence of the broad experience of Ross Engineers in the specialized field of 'Engineered Atmospheres' can be found in the same plant...in the eight Ross Melamine Curing Ovens which prepare the top design sheet and transfer sheet prior to assembling



with the Core Stock. Within these eight ovens, as within the Core Oven, the carefully created 'Engineered Atmosphere' is the heart of the process.

Ross Engineers will be glad to discuss with any company its production problem involving heating, drying, curing, baking, paint finishing, humidifying, treating or otherwise conditioning materials and of related comfort air conditioning and ventilating where an 'Engineered Atmosphere' is the key operating step.

M-R MIDLAND-ROSS

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Breezo-Fin Unit Heater

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Nothing can match the "Buffalo" Breezo-Fin Unit Heater for versatile, economical, efficient "spot-heating" in your plant. Breezo-Fins are especially desirable for your high pressure steam system because **there is no possibility of leakage inside the unit.** The one-piece, seamless copper coil is continuous from inlet to outlet discharge ground joint. This positive "no-leak" feature insures absolute safety for steam pressures up to 250 lbs.

OTHER "BUFFALO" BREEZO-FIN FEATURES:

- **Fins spaced for maximum radiation.**
- **Adjustable louvers to aim heat where needed.**
- **Streamlined, attractive appearance.**
- **High-efficiency fans give quiet operation.**
- **One-piece welded motor mounting.**
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- **Side connections for low headroom, more compact installation.**

For full information on "Buffalo" Breezo-Fin Unit Heaters, write today for Bulletin 3137-E.

FOR HEATING LARGER PLANT AREAS . . .

investigate "Buffalo" Lowboy and Highboy Unit Heaters. Ceiling-suspended Lowboys save valuable floor space. Compact Highboys allow more productive space in low-ceiling areas. Write for Bulletin 3704 for full details.

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"Buffalo"

INDUSTRIAL EXHAUSTERS BELTED VENT SETS PROPELLER FANS "E" BLOWERS-EXHAUSTERS

HITTING STOREROOM WASTE

Begins on page 126

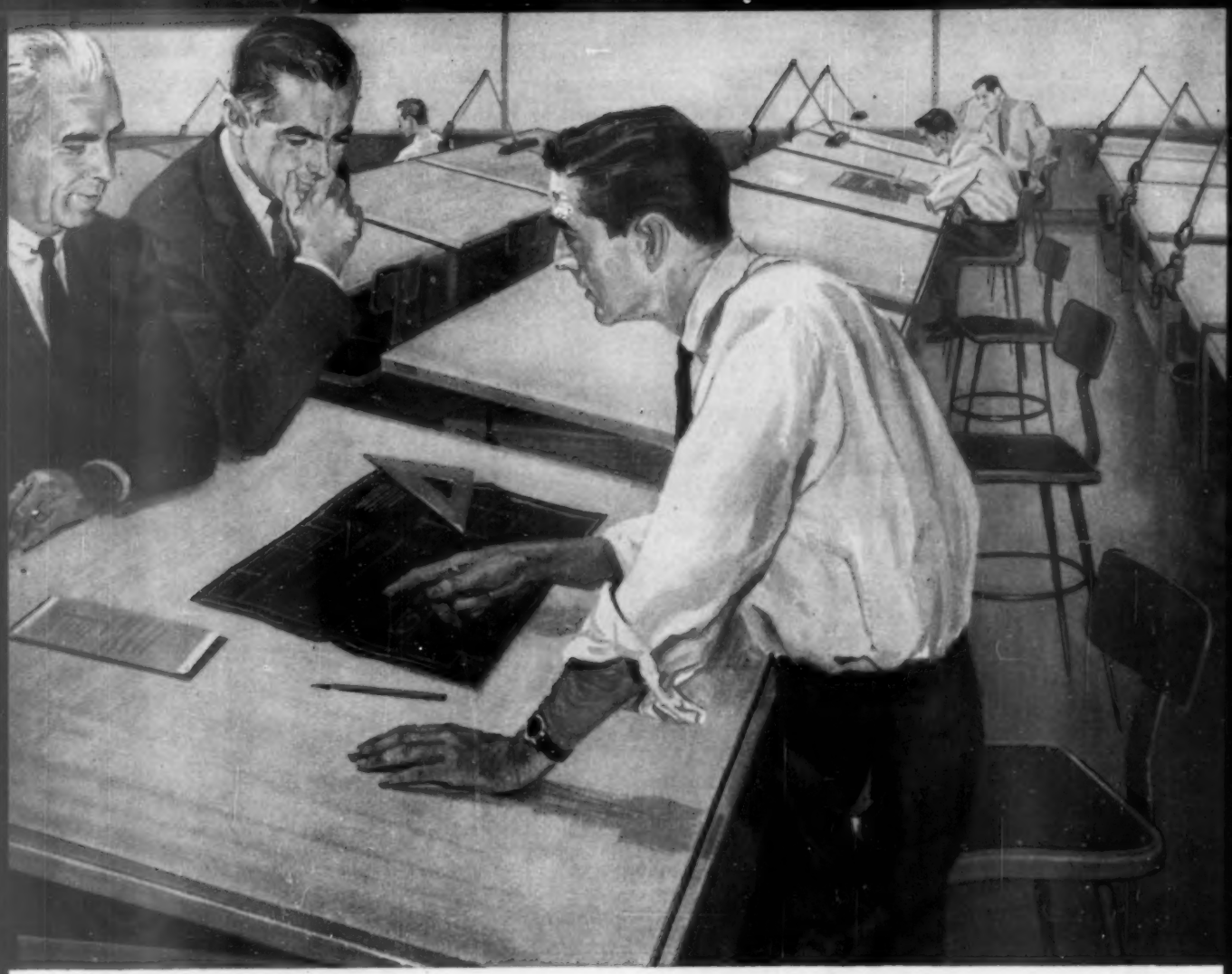
quence that you can't help wondering how they got that way. The answer seems to be that in most companies the number of groups, their heterogeneous character, and their sequence have "just growed" that way. I suggest a more orderly development—more like Miss America than Topsy.

Companies that require several thousand items in their maintenance stores would do well to segregate these into 40, 50, or 60 major groups. These groups can then be bunched into four or so over-all categories (certainly no more than nine), such as electrical, valves and piping, spare parts, and general, with the groups in each category clean-cut, homogeneous, and alphabetically arranged for easy reference.

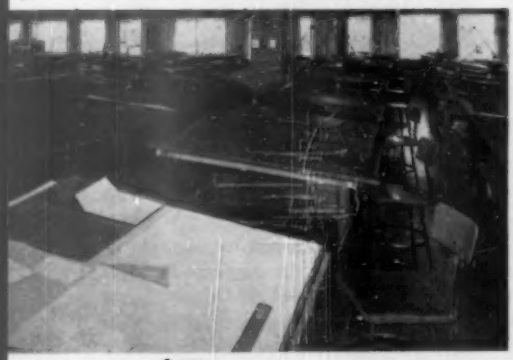
Each major group should be subdivided into minor groups, also alphabetically (or numerically) arranged. Each minor group should list the appropriate individual items, again alphabetically or numerically. Example: the "General" category might be broken into such major groups as Abrasives, Air Conditioning, Automotive, Bearings, Belting, Building Materials, etc.; "Electrical" into Brushes, Coils, Conduit & Fittings, Condulet & Fittings, Hoist & Elevator Parts, Insulation, etc.

How a major group should be divided depends on the type of materials involved. "Belting" in many mills would be flat and V belts, with perhaps a few round ones. Both would be subdivided—the V, for instance, into A, B, C, D, and E widths and the fractional horsepower sizes (3L, 4L, 5L). "Bearings" can be by manufacturer and manufacturer's number (using one manufacturer as the lead bearing). Or by type of bearing (angular contact, double-row, duplex, self-aligning, single-row, etc.). "Pump Parts," by manufacturer. "Hardware," alphabetically. "Valves," by size. "Spare Parts," usually by equipment within a department, sometimes by type of equipment regardless of department. Looking for a published list of standard classifications? Don't waste your time—there is none. You have to build your own list to match your own needs.

Turn the page



McDonnell Aircraft wanted seating to reduce the fatigue factor ... they chose Royal®



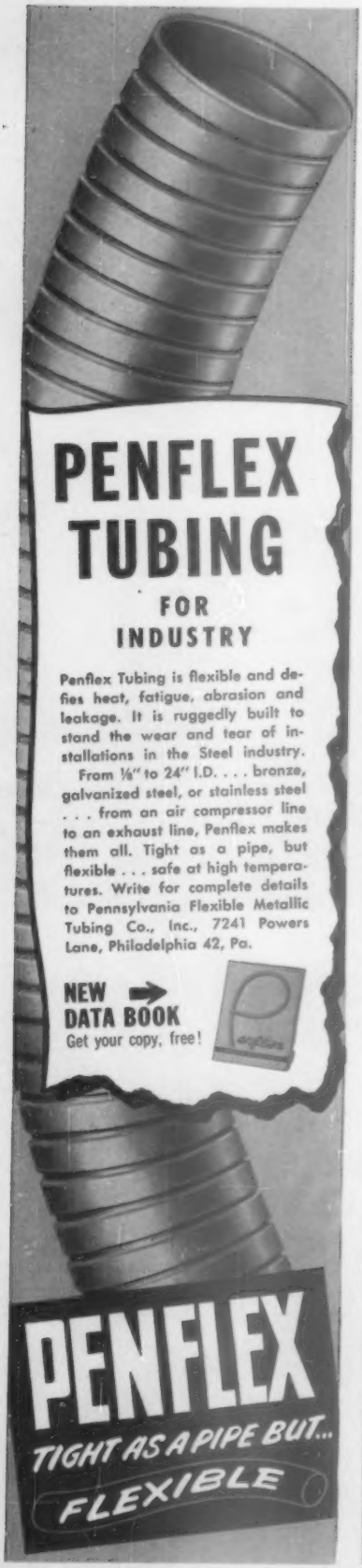
There's no "fatigue letdown" in this busy engineering department, with its "personalized" posture seating by *Royal!* Telescoping chair legs permit quick individual seat-height selection. Back rest adjusts forward, backward, up, down, to exactly suit each person's needs. And the sturdy construction for which *Royal* is famous means top efficiency and economy year after year.

In drafting rooms, factory or front office—*Royal* posture seating helps create efficient alertness that assures better, safer work. See what 60 years' service to business and industry has achieved in modern seating . . . write for your free Catalog No. 7001. Royal Metal Manufacturing Company, One Park Avenue, New York 16, N. Y., Dept. 26-L.

A drafting room at the McDonnell plant in St. Louis. Good lighting, spacious work areas, efficient arrangement and Royal-developed posture seating make this a good place to work.

Royal . . . the preferred furniture of great and growing organizations

For more facts Circle 526 on Reader Service Card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Penflex Tubing is flexible and defies heat, fatigue, abrasion and leakage. It is ruggedly built to stand the wear and tear of installations in the Steel industry.
From ⅛" to 24" I.D. . . . bronze, galvanized steel, or stainless steel . . . from an air compressor line to an exhaust line, Penflex makes them all. Tight as a pipe, but flexible . . . safe at high temperatures. Write for complete details to Pennsylvania Flexible Metallic Tubing Co., Inc., 7241 Powers Lane, Philadelphia 42, Pa.
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DATA BOOK
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PENFLEX
TIGHT AS A PIPE BUT...
FLEXIBLE

5. NUMERICAL CODING

I know of no storekeeping tool more misused than a numerical code. The codes of company after company are handicaps, not assets.

Purpose of a numerical code is simply to assign permanent numbers to stock items that will identify them from now until doomsday. A code should be so designed that a list of items in code-number sequence will automatically find every item in its proper major, secondary, and tertiary group, and in alphabetical or numerical sequence within those groups. The code should be so flexible that the thousands of items that may be added will also fit into their exact alphabetical or numerical niches. You might compare its flexibility to that of the Dewey-decimal filing system—not infinitely expandable—but almost, for practical purposes.

A well-constructed code forces an orderly listing of stock. With a poorly constructed code you can't keep items in proper sequence.

The ideal code? For 10,000 or more items, a 7-digit code would appear to be ideal. When arranged as a 2-2-3 numbering system this code permits 100 major groups (00 to 99), 100 secondary groups (00-99), and 1000 tertiary items (000-999) within each minor group —a potential 10-million numbers.

Why use 10-million numbers for only 10,000 items? Well, the most common error companies make in coding stock is to try to get by on too few numbers. Every 5-digit code I have seen has hundreds (or thousands) of items out of sequence. The same is true of many 6-digit codes after they have been in use for a few years. Look at it this way. The smallest number of digits that can be used comfortably for a major-secondary-tertiary listing is 6. With the obvious advantages of the 3-stage code, it boils down to a 6- vs. a 7-digit code as a minimum. With 6 digits it's going to be nip and tuck for a medium-sized or expanding operation. Seven give comfortable breathing room.

Case in point—You still need to apply a 7-digit code intelligently to make it serve you right. To illustrate: A mill in Georgia has all its anti-friction bearings in major group 05. A separate secondary group is assigned to each manufacturer, and each tertiary group lists the individual bearings by the numbers used by those manufacturers. But there are 18 manufacturers, most of whom make bearings that are freely substituted for each other by distributors. To avoid having 18 places to look for a given bearing, one manufacturer is used as the lead bearings—in this case SKF—and all interchangeable sizes and variations of bearings are listed under the SKF numbers, 241 of them.

Now you might theoretically assume that one major group (05), one secondary (01), and one tertiary (000-999) code should comfortably hold all 241 SKF bearings. With 1000 numbers available in the tertiary group, you can skip 4 numbers between each bearing (some companies don't skip any), still have 759 numbers for expansion.

Well, this treatment is just what makes codes obsolete in short order. Here's how it should be done:

The plant in Georgia allows 10 tertiary numbers between consecutive single-row bearings, such as SKF 6206 and 6207. It actually has the 6206 in 6 variations (plain, with one shield, two shields, two seals, snap ring, and one shield with a snap ring). The 6207 happens to be stocked in only two varieties, but next year it may have seven. Between non-consecutive bearing numbers more tertiary spaces have to be left open, of course. SKF makes over 5000 bearings that this company does not now stock. But it might be called upon to have many of them on hand some day.

The upshot is that seven secondary groups are used instead of one to list the 241 SKF bearings. This allows 700 numbers. To do this with a 6-digit code would take 70 instead of 7 secondary groups.

Gaining by coding—If you have never used a code, you don't know what you're missing. Once you adopt one, you'll wonder how you ever managed to get along without it. A good code has numerous advantages. Here are six big ones:

. . . *Aids accounting.* Machine accounting requires a numerical code for efficiency. So if you have any of your store records on tabulating

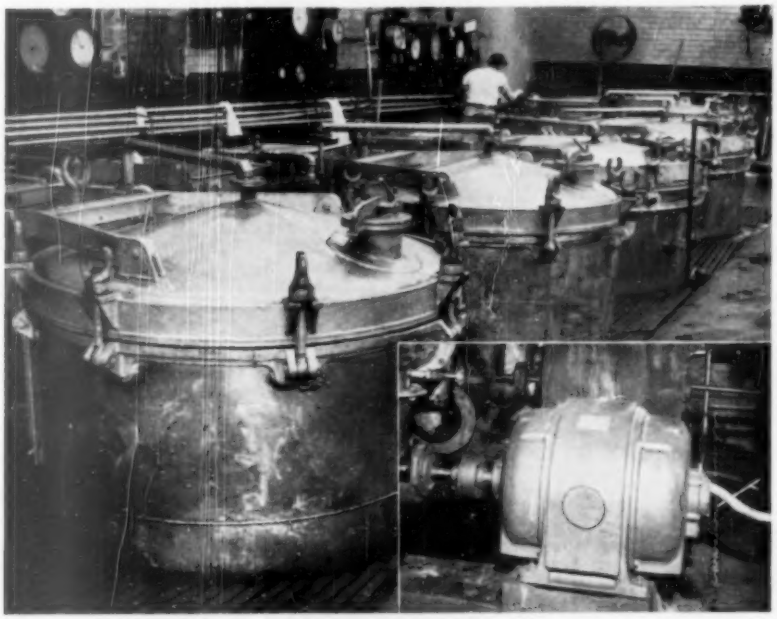
For more facts Circle 528 on Reader Service Card ➤

first in silicones

Dow Corning

SILICONE NEWS

production and maintenance edition · No. 26



TRY THIS MOTOR "SOUP UP"

The insulation you specify for a motor rewind can mean a substantial increase in the motor's horsepower and can save you money in maintenance. Here's evidence.

Wiscassett Mills of Albemarle, N. C., had a problem with one of four centrifugal pump drive units in its package dyeing operation. Like the other three drive motors, this motor was exposed to relative humidity ranging from 90% to 100% and ambient temperatures as high as 130 F. Unlike the others, however, this motor was only 60 hp. The rest were 75 hp. The combination of overloading and high ambient temperatures raised the winding temperatures above the design limits of the Class A insulated 60 hp motor. It was out of service frequently because of insulation failure.

Although Wiscassett kept a spare motor ready for immediate substitution, there was a lot of time, money and production lost. Every time the motor failed, removal and replacement with the standby cost $90. Eight to twelve hours of work were needed, up to 2000 pounds of yarn were lost, and the whole operation was generally slowed down . . . all of which totalled up to a tidy sum to add to the cost of rewinding the motor.

Clearly, something had to be done. The lack of thermal stability and moisture resistance was the weakness of the organic insulation system, so silicone insulation was chosen to solve the problem. Silicones are so heat resistant that they allow motors to run hotter, work harder, deliver more power without insulation failures. When Wiscassett had the 60-hp motor rewound with silicone insulation, its load carrying capability upped well over 25%! Ever since, it's been carrying its load without difficulty, and the entire operation is now running smoothly.

Take a look around your own plant. Are there tough jobs causing motors to fail regularly? Put silicone insulation to work on these tough tasks. You, too, will realize noteworthy savings. *No. 268*

DOUBLES MOLD LIFE

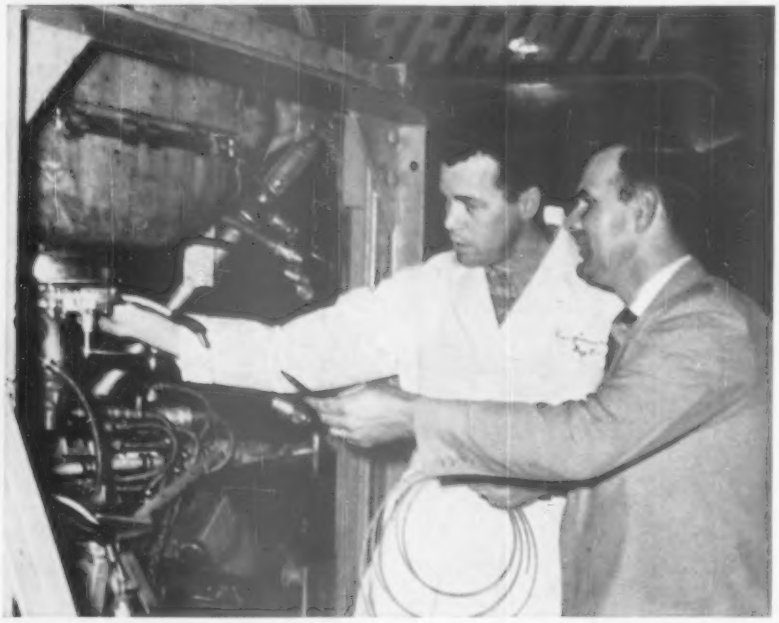
If your plant operations include molding or casting some material — be it plastic, metal, rubber, plywood, or other — you have probably experienced mold release problems. Now, there are ways to combat this. Here's a concrete example:

The Ben Robinson Company of Elk Rapids, Michigan, casts life-like lawn ornaments by pouring a cement mixture into flexible rubber molds. After the mixture hardens, the mold is stripped off, inside out. If the mold didn't release cleanly, small details in the ornament would be lost. And, as with all halfway releases, a lot of mold cleaning would be necessary. But this company has no trouble whatsoever nowadays, since discovering silicone release agents. The Robinson Company reports that when Dow Corning 7 Compound is swabbed on the molds, the results are amazing.

The silicone coating gives a smooth release, and surface details of the castings are perfect. One silicone coating releases 6 to 8 times more ornaments than any release agent previously used. And, most important of all, 7 Compound has more than doubled mold service life. *No. 269*

LOCKS OUT FREEZE-UPS

Winter means ice and ice means frozen locks. If you suffer from this nuisance, here's a dandy idea. *(Cont. Pg. 2)*



CABLE THAT NEEDS NO CONDUIT

Ever wish you could get electrical wiring rugged enough so you could do away with conduits? If you have, you'll be interested in what Braniff International Airways did.

Braniff wanted a better cable for the essential circuits around its planes' engines. Being forward of the engine firewall, the cable insulation would have to have excellent heat resistance, abrasion resistance and flexibility. Braniff engineers tested a variety of high temperature wires before finding just what they wanted.

All requirements were met by cable insulation of Silastic®, the Dow Corning silicone rubber. Lewis Engineering Company (Naugatuck, Conn.), manufacturer of the cable, found that Silastic withstands continued temperatures higher than ordinary copper wire can tolerate. (The copper in this cable is nickel-clad, which has a higher range than ordinary copper). Tests have shown that the insulation resistance of Silastic cable remains above 10,000 ohms even after 15 minutes at 2,000 F!

What this impressive performance means is that *the cable needs no conduit!* Braniff plans to re-wire all its engines this way, making a considerable saving in time and money, as well as a saving in aircraft weight. Think of what it could mean to your equipment to get rid of conduit this way! *No. 270*

FREEZE-UPS *(Continued)*

The city of Quincy, Mass., had trouble with locks on its parking meters. In the words of Charles R. Herbert, Commissioner of Public Works: ". . . we had considerable difficulty every winter with frozen locks on the outer cases, on the money doors, and even on the canvas hoods that are frequently used. Five years ago, we purchased a small quantity of Dow Corning 550 Fluid to lubricate the mechanisms. We haven't had a single freeze-up since." Enough said? Try this trick yourself when winter comes . . . when plant gates, doors, outdoor machinery and other equipment start icing up. *No. 271*

new literature and technical data on silicones

Motors Run Longer under moist conditions when they're treated with 996 Varnish. This water repellent silicone varnish can be applied directly over Class A organic varnish to give motors operating under moist and humid conditions up to 2½ times the insulation resistance of untreated ones. Properties and method of treatment are given in concise, data sheet form. *No. 272*

Slipicone® stops sticking—many difficult clean-up problems are being overcome by processors, packagers and manufacturers through the use of Slipicone, the heat-stable, inert silicone release agent. Its original use as a packaging aid for food processors has broadened to the textile, bottling, printing, carpentering, and automatic vending machine industries — wherever adhesion and buildup is a problem. More information available by writing for . *No. 273*

Effective lubrication from —40 to + 400F. Ball bearings and plastic parts lubricated with Dow Corning 44 Grease give better performance longer, because of its constant consistency, low volatility, and resistance to heat, oxidation and breakdown under shear. A four-page brochure lists properties and gives illustrated descriptions of the wide variety of profitable applications. *No. 274*

Want more capacity without expansion? Precious formulating space formerly consumed by suds and all types of excess foam can now be utilized to increase processing volume through the use of fast-acting Antifoam B, a silicone defoamer that can be simply applied either during or prior to formation of foam. Antifoam B has excellent temperature stability, good shelf life, remarkable effectiveness, and is the lowest priced silicone defoamer available. *No. 275*

Visual Proof. The many benefits of silicone electrical insulation are shown in the sound and color movie, More Muscles for Tomorrow. A descriptive folder tells how to arrange for showings in your plant. *No. 276*

New 1959 Reference Guide to Dow Corning silicone products is now available. Fresh from the printers, this file size brochure contains indexed sections covering silicone fluids, dielectrics, protective coatings, release agents, water repellents and Silastic, the Dow Corning silicone rubber. A handy rapid reference to the specific silicone product that will solve your production and maintenance problems. *No. 277*

Dow Corning Corporation, Dept. 5112a, Midland, Michigan
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MIDLAND, MICHIGAN

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equipment, or may in the future, you should have a numerical code. If you have tabulating equipment and are not using it for storekeeping, you probably should be.

. . . *Saves time.* It's a good deal quicker to refer to a 7-digit number than to a 17-word description. You can find a number in numerical sequence faster than you can find a dozen words, no matter how orderly the wording may be. Companies that have good codes almost invariably look for an item by number rather than by description.

. . . *Improves accuracy.* A description and a code number provide a double check. Many descriptions are confusing—not only to girls who blush at mention of a round bastard file but also to window men with years of experience. It is a lot easier to detect the differences between 83-10-480 and 83-17-600 than to differentiate between the verbal descriptions of a couple of Westinghouse turbine parts.

. . . *Forces orderliness.* A good code forces an orderly set of storeroom records—a bad code may have the opposite effect. When a new item is received someone has to assign it a number. He has no choice but to look in the card file or stores catalog to see what number to give it. So he reviews the descriptions of the items in front of and in back of his new acquisition. Net result: The new piece is more apt to be blessed with the correct nomenclature and proper code number, and to wind up in the group where it belongs, than if no number had to be assigned and merely words applied. This is just as true for companies that don't have machine accounting as for those that do.

. . . *Simplifies reports.* Code numbers provide an automatic classification breakdown for analyzing and comparing inventory within a plant or between plants. With machine accounting this is most obvious. Many companies print inventory figures every month, with variances, for their various major groups (bearings, belting, pump parts, etc.).

. . . *Eases cataloging.* Code numbers permit easy catalog printing. Especially if you have machine tabulating equipment, or if you have a

Because this has what it takes...
The rugged durability and extra value (Timken tapered roller bearings in every wheel, spring loaded non-kicking handle, slide planes for easy pallet entry and 360° lifting radius as standard) of the REVOLVATOR Red Giant hand lift pallet truck (above) has built a reputation which means that . . .
We were called on to do this...
Red Giant Hand Lift pallet truck
Explosion-proof High-lift Go-Getter

One of six basic models . . . REVOLVATOR Series 54.00 Go-Getter for use in explosion hazardous areas for chemical and related companies with Class I Group D or Class II Group G hazards designed at the request of one of the country's leading safety authorities. This electric lift truck meets requirements for both hazards and utilizes screw type housings hydrostatically tested to pressures far beyond those required. Additional safety feature—hydraulically operated disc brake.

Therefore: Whether you need a standard piece of material handling equipment or specially designed equipment, call on

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▶ Evaporating a very small amount of water in an air stream you can cool liquids, gases or vapors with atmospheric air, removing heat at the rate of input, controlling temperature precisely. Save 95% of the cost of cooling water; save piping, pumping and power. You quickly recover your equipment cost.

You can cool and hold accurately the temperature of all fluids, condense vapors, cool water, oils, solutions, intermediates, coolants for mechanical, electrical or thermal processes. You have a closed system free from dirt. You have solved all problems of water availability, quality or disposal, maintenance expense is low.

You may apply this to solvent recovery, vacuum systems controlling reactions, condensing distillates, cooling reflux products.

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SINCE 1904 BROOK MOTOR CORPORATION

HITTING STOREROOM WASTE

Begins on page 126

tabulating service bureau within a few hundred miles. A typewritten catalog is more effective in code number sequence than without a code. (Again, only if the code is good and doesn't require two or more niches for similar items. Otherwise I've seen several companies that had to have two catalogs, one by code numbers, the other alphabetically. You had to look at both to locate all niches. Every correction had to be made on both catalogs.)

Multi-plant systems—How about the company with several plants? Fortunate fellows! The company with three plants has four times as much to gain by adopting a good code as the one-plant company. Not only are the advantages of the code at one location extended to all three, but the head office has the further advantage of having a uniform system at all locations.

This raises an important point. Suppose a company adopts a 7-digit code at its New Jersey plant and plans to extend the code to its other two (or four or ten) locations. Suppose the code it adopts places all "VALVES" in major group 55, all "VALVES—½-IN." in secondary Group 55-04, and "VALVE, GATE ½-IN. STEEL 1500#" at 55-04-365. If that identical valve is stocked at four of the corporation's ten plants, should they all be compelled to assign it the same number (55-04-365)? Or is it sufficient that each plant put its valves in 55, its ½-in. valves in 55-04, and not attempt to tie in the tertiary number?

Let's see what's involved here. It is theoretically possible to buy gate valves in 39,000 variations. They come in about 10 different metals and trims, 3 fittings, 10 pressures, 22 sizes, plus at least half-a-dozen other variations (quick-opening, rising-stem, etc.). And there are several dozen types of valves other than gate. So allowance for every possible variation of every type of valve—including some that haven't even been invented yet—makes for a somewhat astronomical coding problem. I've seen cumbersome 8- and 10-digit codes used by companies that insist on all digits being the same at all plants.

It also means that every new item

STRONG

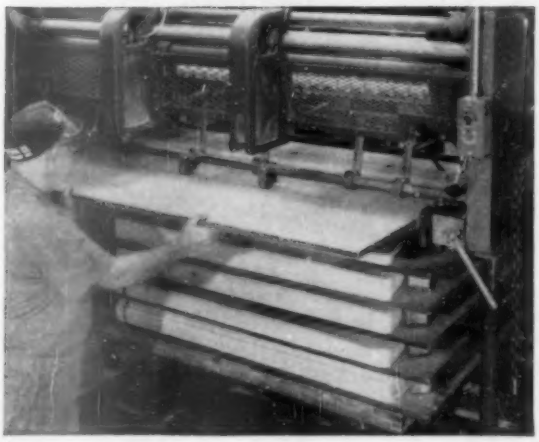
Plywood flooring system boosts load limit in office building

A special flooring system, using stout 1⅛" thick plywood over steel joists helped solve a heavy loading problem encountered when Pacific Telephone and Telegraph Co. decided to mount a battery of huge IBM data processing machines in an older building. Conventional load limits in most office buildings is about 70 lbs. psf. The new plywood floor and specially designed joists boosted the live load rating to the required 200 psf, and permits a concentrated load of up to 1,000 lbs. per machine leg to be transmitted to the floor on large rubber casters resting on steel plates.

DURABLE

Overlaid plywood fume exhaust ducts outlast metal

Switch from metal to overlaid plywood for exhaust manifolds at this giant cellophane plant has sharply reduced maintenance and replacement costs. Installed over four years ago, the ducts have shown no sign of deterioration under continued exposure to sulphuric acid mist, carbon bisulphide, water vapor and other chemical fumes. High density overlaid plywood was used for the manifolds. It has hard, glossy, fused phenolic resin surfaces that are highly resistant to acids and other chemicals. It is virtually impervious to vapor and requires no paint or other protection.



LOW COST

Plywood pallet trays halve labor and storage costs

Fir plywood off-bearing pallet trays in this operation at Myercord Company in Chicago, permit one man to do the work of two and cut storage space in half. The big one-piece pallets are used for storing and handling decals. They're strong, splitproof and light in weight. Previously the company used ¾-inch lumber mounted on 2 x 6 skids with pipe legs to take the weight of individual loads. The bulkier lumber pallets required an additional man at the off-bearing end of the press and consumed twice as much storage space as the new and simple fir plywood pallets.

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A SUBSIDIARY OF THE AMERICAN METAL PRODUCTS COMPANY OF DETROIT
3020 NORTH BURDICK ST. amp® KALAMAZOO, MICHIGAN

HITTING STOREROOM WASTE

Begins on page 126

stocked in any of a corporation's plants must be cleared through a central point to make sure the number wanted hasn't been assigned to some similar piece. This might be worth the expense and red tape if big benefits resulted. Actually I believe more would be lost than gained. You are liable to lose time and code-spread flexibility and invite the expense of more overhead. What's more, each plant would lay itself open to questioning by head-office people on why the plant couldn't use the same type of valve or trim that the Podunk plant is using.

In my experience it's necessary—and even desirable—to have only the major and secondary groups the same at each of several plant locations. If all ½-in. valves are in 55-04, and if they're arranged at all plants in the same order within that group, then let each plant assign the tertiary numbers that give the flexibility it needs.

For instance, valves can be listed first by size (⅛ to 24 inch), next alphabetically by type (angle, check, clock, diaphragm, gate, globe, etc.), then alphabetically by metal (all-iron, bronze, cast-iron, etc.), and last by whatever other variables are significant (pressure, fitting, etc.). The manufacturer does not need to be mentioned if the same valve is available from several companies.

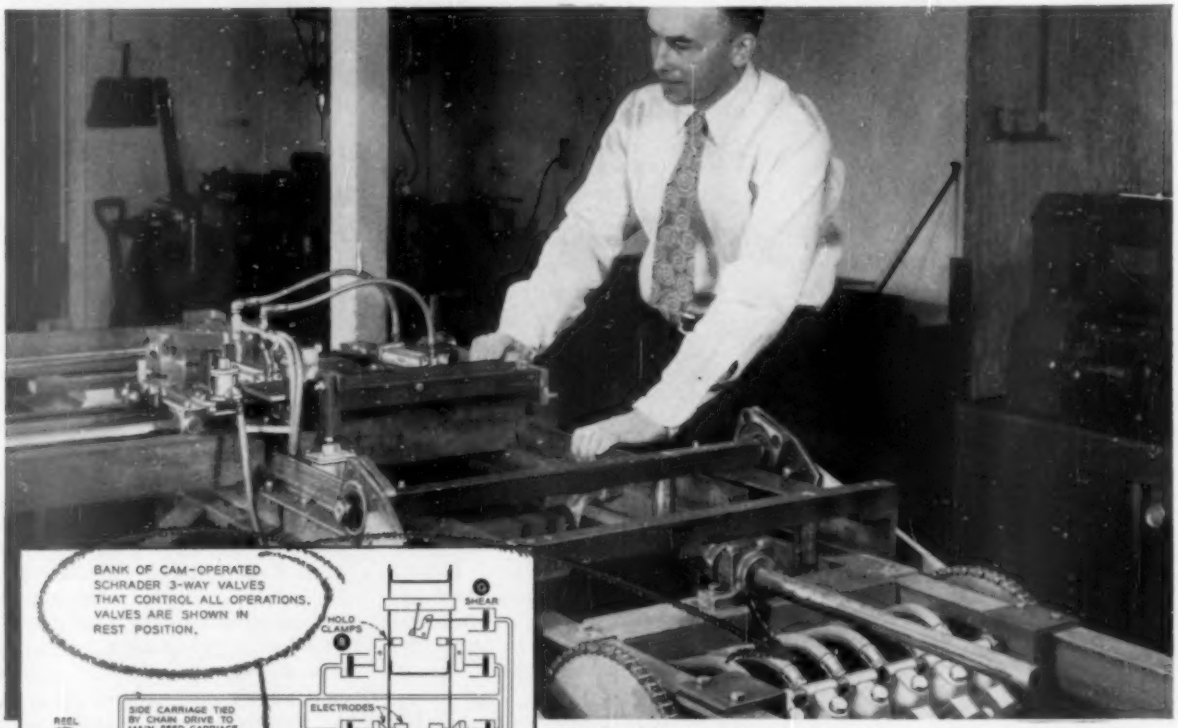
It's quite true that in many categories it is perfectly feasible to have all 7 digits mean the same thing in all sister plants. Machine bolts, pipe, pipe fittings, etc., are only made in certain sizes, so a minimum of flexibility is required. For parts used in production there may be definite advantages. But that's not what we're concerned with here.

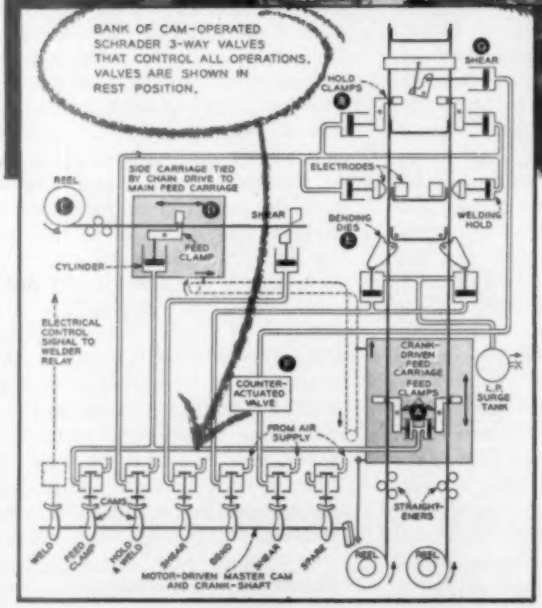
Some people claim that an identical code number at all plants of a company would enable one plant to ask another for an item by the code number only. True, but I think if the storekeeper at one plant wants a spare part from another, he would ask for it by description as well as by number anyway. Sure, a head-office purchasing agent would like the same number used at all plants so he can easily find how many #318 single-row bearings the whole corporation uses, to get a special price

YOU, TOO, CAN AUTOMATE IT YOURSELF ...WITH SCHRADER AIR PRODUCTS

Very often you can automate manufacturing operations simply by applying Schrader air controls to existing plant facilities.

Here's a man with ideas who automated a complex job—increased production, reduced unit costs, safely and easily—without making a large capital investment. He did it with a planned Schrader air control system. Chances are excellent that you can do the same thing—with Schrader air products. Air can do an almost limitless range of work: automatic drilling, reaming, clamping and holding, shearing, forming, staking, grouping and interlocking assembly operations for quicker parts handling and assembly.





PROBLEM: Feed heavy wires into machine, shear off pieces, shape them, weld pieces together and eject as finished wire webbing. Fast. Economically. Automatically.

SOLUTION: Air Controls selected from Schrader's complete line. Neat bank of valves—actuated by cams on master cam shaft—operate synchronized system. Clamps A feed wires to holding Clamps B as carriage moves back and forth. Counter-actuated valve F operates cut-off shear G after desired number of cycles. Wire C, fed from carriage D, is sheared, formed by dies E, welded to the other two wires.

RESULT: One man performs *double* the output of three men at a fraction of the cost of a new machine.

Design it yourself! Schrader Air Control components—the most reliable self-contained power units—can help you adapt quickly to your manufacturing needs.

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Company_____

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See these reels at the Plant Maintenance and Engineering Show **SPACE 224**

SCRUBBING THE SURFACES OF PLANES to reduce friction at supersonic speeds formerly was done by several men, working laboriously with hand cleaning equipment. But the installation of cleaning units like this one, equipped with WELDREEL dual hose reels, has cut to a minimum the time and manpower required . . . *and results in better cleaning.*

Using one hose for compressed air and the other for cleanser or detergent, cleaning may be completed in a short time by one man. The reel permits hose to be paid out to the length required . . . holds it there with a self locking pawl . . . and retracts it automatically with a heavy spring.

Designed to handle flammable fluids and gases safely in dual and single hose, leakproof WELDREEL reels are adaptable to a wide variety of industrial applications. Write for full information.

MODEL OA-A holds 50′ of 3/16″ or 40′ of ¼″ dual hose. Model OAB has capacity for 150′ of ¼″ or 125′ of 5/16″ hose.

MODEL EA-2 with current capacity of 300 amps holds 50′ of 2/0 welding cable. Model EA has capacity of 100′ cable.

MODEL A-1 has 50′ capacity of ¼″ or ⅜″ I.D. single hose. The larger Model A-2 holds 50′ of ½″ hose.

UNITED SPECIALTIES INC.
POST OFFICE BOX 598 EL DORADO, ARKANSAS

on large volume. That technique is worthwhile on raw materials, but I suspect the cost exceeds the benefits on maintenance items.

6. UP-TO-DATE CATALOG

A catalog that lists all items stocked is obviously not a prime necessity, because many companies get along without one. But I've often been impressed with how useful a catalog can be by the constant use some companies make of even grossly inadequate listings.

In a plant in Virginia I found a stores catalog that was a bigger mess than any I had ever seen. Nearly every page had one or more sheets of supplementary information stapled to it. Yet when I asked the storekeeper if we could take it to the manager's office for half an hour he said, "No, the window men would be lost without it!" So, you decide whether a good catalog would be more useful. As a rule, once a plant has a catalog, it finds a heavy demand for copies. Maintenance foremen and work planners use it for planning and estimating. Project engineers, area engineers, plant engineers want copies. Production heads like to check spare parts lists. It's a basic reference for the maintenance manager.

If a company has machine tabulating equipment, a good catalog is practically a free by-product of good nomenclature, good groupings, and a good code. At 100 cards per minute an ordinary tabulator can run off half-a-dozen copies of a catalog containing 10,000 different items in a couple of hours.

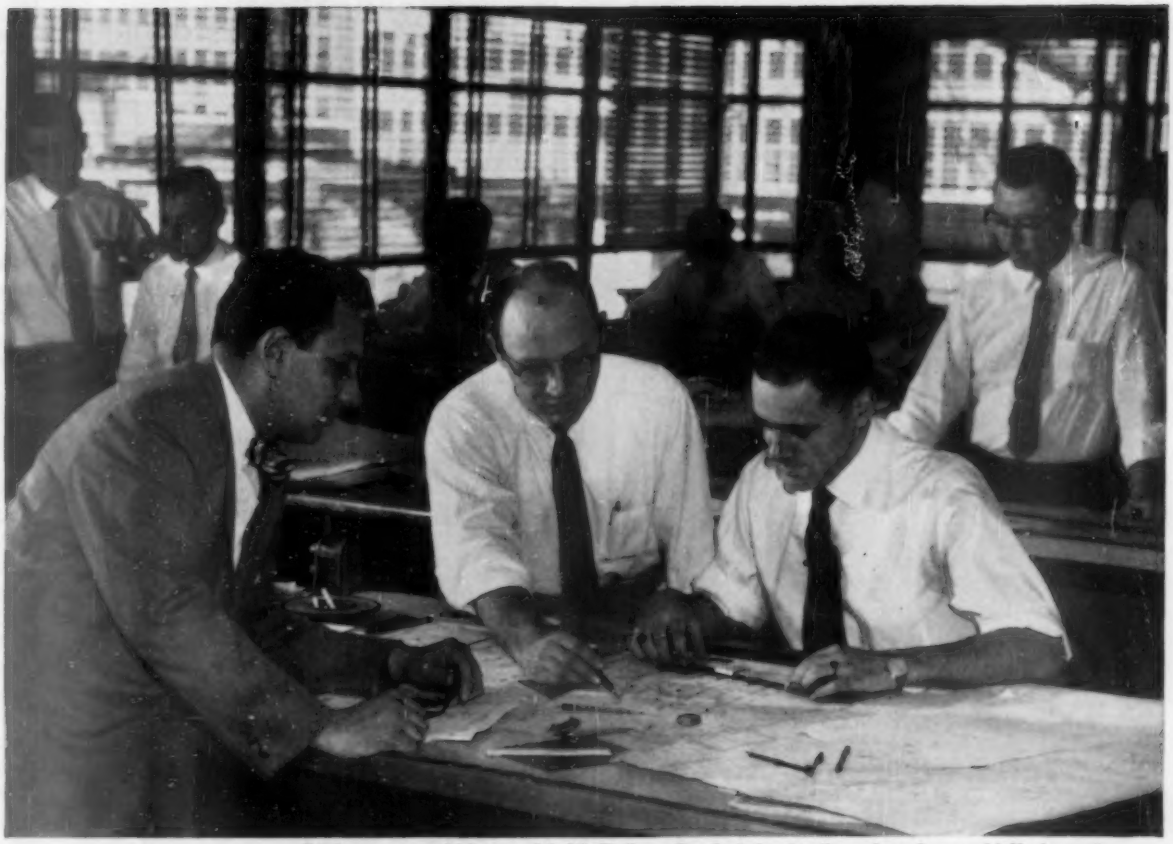
Make-up of a catalog is simple (see sample on pages 128 and 129). There should be an index page at the front listing all major groups. This should be followed by as many pages as you need to list all items in code number sequence. Such listing should be divided into as many sections as there are major groups. Each major group should be preceded by its own index page showing the minor groups into which it, too, is subdivided. (And it would be helpful to list on the proper index page an explanation of abbreviations used in that section.) This make-up allows distribution of any specific sections of the catalog to users who don't need the whole ball of wax.

What should a catalog show for each item? The following information would all be useful:

- Code number. In code number sequence. With a sound code this would also be by groups and subgroups, with every item in either alphabetical or numerical sequence.
- Description. Long enough to be recognizable (but not necessarily to order from), brief enough to fit the catalog. Adequate limit: 25 to 30 characters.
- Unit of issue. Gallons, feet, pounds, single item or gross, etc. (Two spaces is enough for an easily recognizable abbreviation.)
- Maximum (or reorder quantity).
- Minimum (or reorder point).
- Unit price. This can't be kept up to date, but is useful in informing users of approximate cost. Latest price can be used whenever the catalog is reprinted.
- Location. Tells where to find the piece in the storeroom. Section, aisle, shelf, bin—whatever system is used. If the catalog is in simple form, it should be easy for anyone to find anything in the storeroom by looking up its location in the catalog. This feature is especially helpful for slow-moving stock—or at night if clerks don't work around the clock. As for breaking in a new window man, the time can be measured in days instead of weeks or months. I've had many clerks tell me, "I've been here 5 years and I still don't know where everything is."

Some of these data may be omitted from some copies of the catalog. The engineering department, for instance, might find the unit price helpful in estimating approximate cost of a job, and the minimum quantity useful in knowing how many of a commodity may be available. "Maximum" it could get along without. And "Location" is of concern only on the storeroom copy of the catalog.

Updating the catalog—This floors many companies. An oil refinery in Delaware tried to get around it by listing everything it stocked, plus everything it felt it might ever stock. All added up to 20,000 items, of which only 7000 were actually available. Imagine the complications



Engineers at world-famous M. W. Kellogg Co. find the detail on these 8-year-old Kodagraph Autopositive Paper intermediates easy to read. Same goes for the white prints made from them.

"8-year-old Autopositive Paper intermediates good as new!"

Talk about file-life . . . ability to take it!

Even the oldest Kodagraph Autopositive Paper intermediates in M. W. Kellogg Company files are legible, usable, printable.

After countless trips in and out of the files, line detail is still a dense photographic black—no loss of legibility or opacity. Backgrounds are still white—no yellowing, or loss of translucency. And, equally important, there is no trace of brittleness. These 8-year-old Autopositive Paper intermediates are as easy to handle in reference and printmaking as newly made ones!

Order these low-cost paper intermediates from your print room or local blueprinter. You'll be happier today and in the years ahead!

EASTMAN KODAK COMPANY
Graphic Reproduction Division, Rochester 4, N. Y.

Kodagraph Reproduction Materials

MAIL COUPON FOR FREE BOOKLET

FRESH OFF THE PRESS!

This Free Booklet shows all the short cuts possible in drafting room and print room with Kodagraph Reproduction Materials

EASTMAN KODAK COMPANY, Graphic Reproduction Division
Rochester 4, N. Y.

Gentlemen: Send me a free copy of your booklet on Kodagraph Reproduction Materials. 17-12

Name_____ Position_____

Company_____

Street_____

City_____ Zone____ State_____

Kodak
TRADE MARK

For more facts Circle 536 on Reader Service Card

Ask Standard

how to cut costs with conveyors

JERSEY COAST FREIGHT LINES, INC., NEPTUNE, NEW JERSEY, uses a variety of Standard conveyors. Here, powered EXTENDOVEYORS and gravity roller conveyors move freight from trucks to handler for distribution to three conveyor lines in terminal. EXTENDOVEYORS can stretch and retract.

"Tailored" conveyors handle small shipments 66% faster

The formerly tedious job of unloading, sorting and reloading multiple small shipments at this terminal is now a fast, easy operation. A system of Standard conveyors has cut handling time 66%, eliminated congestion, reduced physical effort.

This smooth-functioning system typifies the efficiency and economy possible with Standard conveyors . . . wherever materials must be moved. They're easy to install and exceptionally durable, offer maximum flexibility at low costs, can be designed to meet any operation or space requirement.

For details on Standard's complete line of gravity and power conveyors — permanent and portable — contact STANDARD CONVEYOR COMPANY, General Office: North St. Paul 9, Minnesota.

FAST, CONVENIENT SORTING is done off three conveyor lines consisting of Standard HANDIBELT powered units and gravity roller conveyors. At right, HANDIBELTS form conveying "bridge" under which terminal personnel and fork-lift trucks can easily pass.

Call the Standard representative listed in the yellow pages of your phone book or write direct for Bulletin 309. Address Dept. G-12.

Standard — 50 years of conveyor experience

GRAVITY & POWER CONVEYORS

Sales and Service in Principal Cities

Sears Roebuck would get into if only one-third of the things Hiram Green out in Iowa ordered by catalog could be supplied. This was a short-lived experiment.

Here's a more practical approach to keeping a catalog up to date:

Suppose a mill prints a catalog of 10,000 items on Aug. 31. In September, 35 new items are added to stock that are not in the catalog, 20 more in October, 40 in November. To reprint the entire catalog with the additions would be expensive. I suggest a supplementary list be published showing the 35 items added in September. At the end of October, another list showing the 20 received in October—but also listing the 35 September items interspersed in code number sequence. The September sheet would be thrown away, same for November, and so on. Thus at the most there would be only two places to look: the master catalog, and the latest monthly supplement. Perhaps once a year the whole catalog could be reprinted to include all additions and drop all deletions.

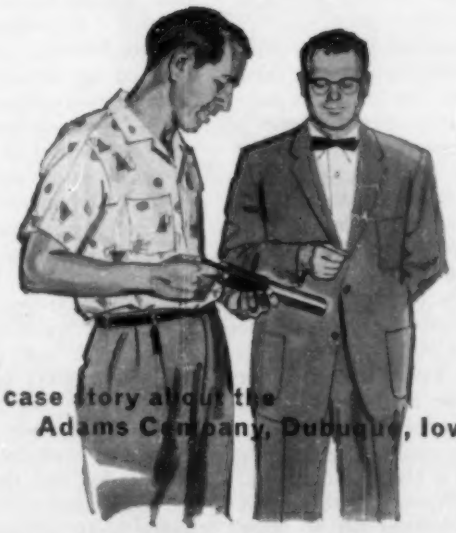
What if you don't have machine tabulating equipment to do this the easy way? Perhaps a nearby service bureau can handle it. Or it can be photographed or typed. The storeroom copy can be double- or triple-spaced so it can be updated daily with handwritten entries.

Better inventory control—Here's where a catalog can shine. You can give each department head a list of the spare parts in stock for his equipment. He can review max-min values, check on usage, and set inventory at the lowest safe level. If a piece of machinery is removed, he can check off the spares carried for that machine and get rid of the obsolete items immediately (instead of 6½ years later, as one company did on $700 worth).

Detecting duplicates—In a catalog they will show up like a pair—or a trio or a quartet—of sore thumbs, because like items are listed right next to each other on the same page. For instance, the last central storeroom I studied revealed 49 duplicate bearings during a perusal of four Kardex trays. Storeroom before that showed 96 duplicate bearings scattered through 500-odd anti-friction

Bob showed them a new product that ended rust on work and tools—

STANDARD Special Transparent Coolant



A case story about the Adams Company, Dubuque, Iowa

Before Standard Oil lubrication specialist Bob Wenger told The Adams Company management about Standard's SPECIAL TRANSPARENT COOLANT, there had been considerable trouble with rusting of work and machines in the plant. There had also been trouble with deposits on the ways of the grinding machines. Rust occurring on parts being processed was resulting in damage and even losses. This has been changed.

"Since we changed to your SPECIAL TRANSPARENT COOLANT, we have not had any rusting or deposits on our machine tools, and this product has eliminated the rusting problem on parts being processed through our plant," says Harlow Adams, president of the company.

The Adams Company found they received important additional benefits as well. Operators could now see their work clearly. There was less wheel loading. Because the coolant didn't foam, more of it stayed on the wheel resulting in cooler operation. Faster cuts were obtained with finer wheels. Finer wheels gave better finishes. Periods between dressings were extended. Tolerances were maintained.

Research, development and more than two years of field testing have gone into Standard's SPECIAL TRANSPARENT COOLANT. This is the pay-out to you on the research done by Standard Oil to bring you better metalworking products. Find out more about Standard's SPECIAL TRANSPARENT COOLANT. Call your nearby Standard Oil lubrication specialist in any of the 15 Midwest or Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

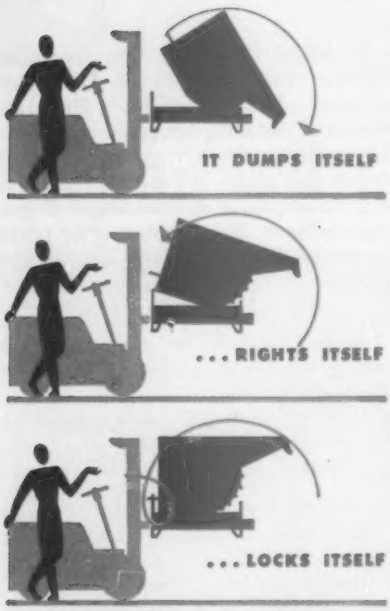
Quick facts about
Special Transparent Coolant

- Clear, transparent fluid.
- Able to control corrosion and rust on work and machines.
- All chemical. Does not support bacteria growth.
- Unaffected by humidity.
- Nonfoaming.
- Fire resistant.
- Odorless.

No rust. Shaft ground with Standard's SPECIAL TRANSPARENT COOLANT shows no rust on inspection by A.T. Murphy, General Superintendent, Harlow Adams, President, and Bob Wenger, Standard Oil lubrication specialist.

You expect more from STANDARD *and get it!*

For more facts Circle 538 on Reader Service Card



How to cut scrap handling costs 50%

Here's the fastest, lowest cost method of scrap handling ever devised. Hundreds of industries are now using Roura Hoppers instead of barrels or tote boxes to collect scrap metal. They're placed alongside machines or in strategic locations. When full, lift truck operator picks up loaded hopper . . . transports it to scrap bin or freight car . . . flips the latch . . . and the hopper automatically dumps its load, rights itself, locks itself. Hopper is returned to its station and operator is free for other work.

Segregation of scrap is simple. Hoppers can be marked for copper, brass, stainless, etc. Brings higher prices.

Roura Hoppers are made in five sizes, ½ to 2 yard capacities. Sturdily built of 3/16" steel plate with continuous arc-welded seams. Also available in stainless steel or galvanized. Mounted on live skids or a choice of wheels. Standard models available for immediate shipment from stock.

Start cutting costs now . . . with Roura Hoppers. *Remember . . . if it's as good as a Roura it IS a Roura.*

ROURA
Self-Dumping
HOPPER

HERE'S HOW to get more details about Roura Self-Dumping Hoppers. Just attach this coupon to your letterhead . . . sign your name . . . and mail to . . .

ROURA IRON WORKS, INC.
1423 Woodland Ave., Detroit 11, Michigan

bearing cards, each with its own max-min figures. V-belts were almost as bad. One B-97 V-belt was being used in five different locations, with 3 to 7 belts per drive. There were five cards for that B-97 belt—one card for each place where it was used. V-belts have since been reduced 58% in volume, 54% in value.

Pin-point accuracy—Lack of a catalog means that plant maintenance men must rely on memory to exercise control. No man is that good. In a typical medium-sized pulp and paper mill an instrument foreman would have some 650 different parts in stock. Is Foxboro gasket No. 20299 among them? If so, how many does he carry? How many should he carry? A millwright foreman would have around 600 pump parts for 15 to 20 different makes of pumps. What sizes and how many impellers are carried for his Worthington pumps? What sleeves for Ingersoll-Rand? Plus 598 similar questions. Spare parts? For the power department, 840; 315 for the superintendent of the paper machines. No wonder maintenance men walk around with that far-away look in their eyes.

A large chemical plant in New Jersey has 5000 instrument parts (estimated—no list of them anywhere). The instrument foreman is his own storekeeper—for almost as many parts as there are in central stores. A pharmaceutical plant in New York State has 186 different electronic tubes, to mention just one item. A lot of stuff to remember.

The answers can be found—in some companies—by going to the storeroom (or accounting or purchasing) and looking at 650 (or 5000) separate instrument cards. Even if all the cards are arranged in logical order, it would be a memory feat worthy of a $64,000 quiz contestant for a foreman to remember it all—with no written list to refer to. And even if those instrument parts were listed alphabetically (from adapter to yoke) through 8000 to 15,000 cards, it would take the foreman hours to find all his parts, let alone memorize what he has.

It's amazing how maintenance and stores people get along as well as they do. It would be even more amazing if they didn't play safe and keep a few extras on hand "just in case." A "few" extras on 10,000 items can soon run into hundreds of thousands of dollars unnecessarily tied up—at $20,000 per year for each $100,000 of inventory. Could this be your plant?

ONE MORE WORD

There's one extremely important aspect of storekeeping that has not been mentioned. More and more companies are insisting on getting accurate maintenance cost figures. They want to know how much it costs to maintain a machine, a pump, a group of tanks with agitators. They want the maintenance cost of all the significant equipment within a department, and department totals, for each month. All this preferably on one piece of paper for a whole year, in order to make comparisons and evaluate trends.

It can be done. Maintenance costs are made up of labor and material. Labor cost is easy to get. A maintenance man can charge his time directly to the piece of equipment he's working on. Any material he gets from the storeroom can be charged the same way. But suppose it's company policy—and it's common—to charge out material when received instead of when used? Or to charge to the department instead of to the equipment? Or to charge the four bearings just ordered to the pump on which the last bearing was used rather than to stores stock? Suppose 2000 "inexpensive" items are issued "free"? Suppose the store records are full of inaccuracies? Then how good are your maintenance costs?

The company that takes the trouble to straighten out its storekeeping has laid the foundation for the accumulation of accurate maintenance costs whenever it wants to take that next step. And knowing just how much it costs to maintain each of several hundred major pieces of equipment within a plant can be the means of saving even more money than through the storekeeping improvements themselves. Any good maintenance manager will tell you that is so. **END**

Don't wait for production to stretch your electrical system

POWER-UP

for distribution system flexibility you can depend on

Take a good look at the electrical distribution system in your plant. As production becomes more automated, power needs increase and allowable voltage tolerances grow smaller. In fact, if your plant is average, kilowatt consumption is increasing 8% per year. You can't wait for production to demand electric power—your POWER-UP program must start today—

J-96117

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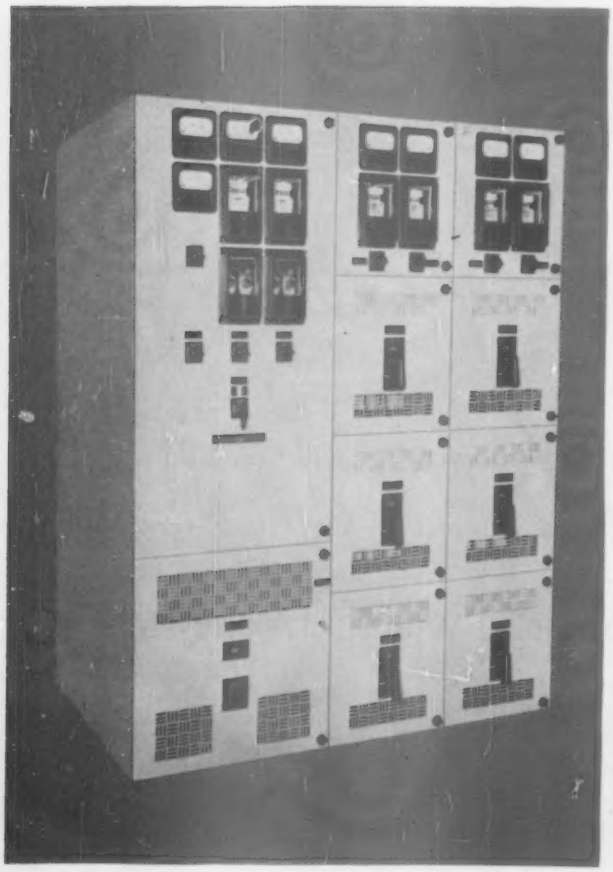
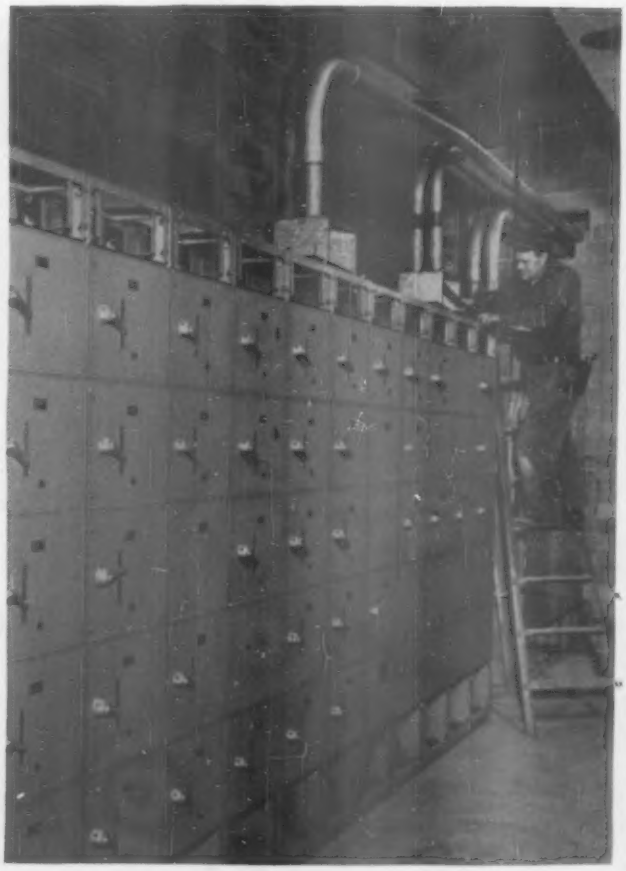
YOU CAN BE **SURE**... IF IT'S Westinghouse

Here's how a *POWER-UP* program can give electrical system flexibility to meet production requirements



WESTINGHOUSE LOW-VOLTAGE METAL-ENCLOSED SWITCHGEAR with drawout DB Circuit Breakers provides superior power circuit protection and flexibility in operation and maintenance. Standardized design with "custom assembled" features meets all modern application requirements without special design or engineering costs.



WESTINGHOUSE CONTROL CENTERS provide flexibility unlimited by floor arrangements and number of starters in use. Versatility is offered by quick addition or removal of structures and easy relocation or replacement of starters. Compact centralized control in one basic design assures coordinated motor operation.

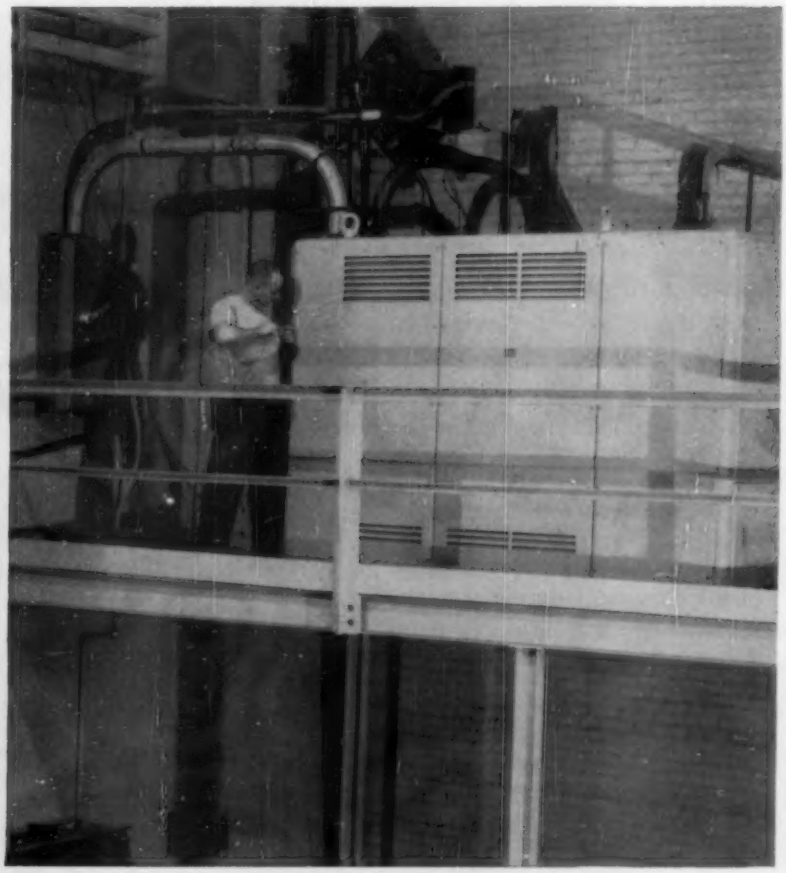
What happens when a distribution system can't be stretched another inch? Additional machines can be the reason — changing production requirements can cause it, too. The only answer is an adequate distribution system with the built-in flexibility to meet your future requirements.

That's why it is important that you call on Westinghouse industry-experienced engineers now, for help in planning your POWER-UP modernization program. For convenient, economical, machine-site power, Westinghouse can furnish the assistance and the work-together equipment you need to do the *complete* job.

A Modern Westinghouse Distribution System assures you the advantages of convenient layout — easy maintenance, too. There's profit in planned power. Call your Westinghouse salesman. Or, write Westinghouse Electric Corporation, 3 Gateway Center, P.O. Box 868, Pittsburgh 30, Pa.

J-96108

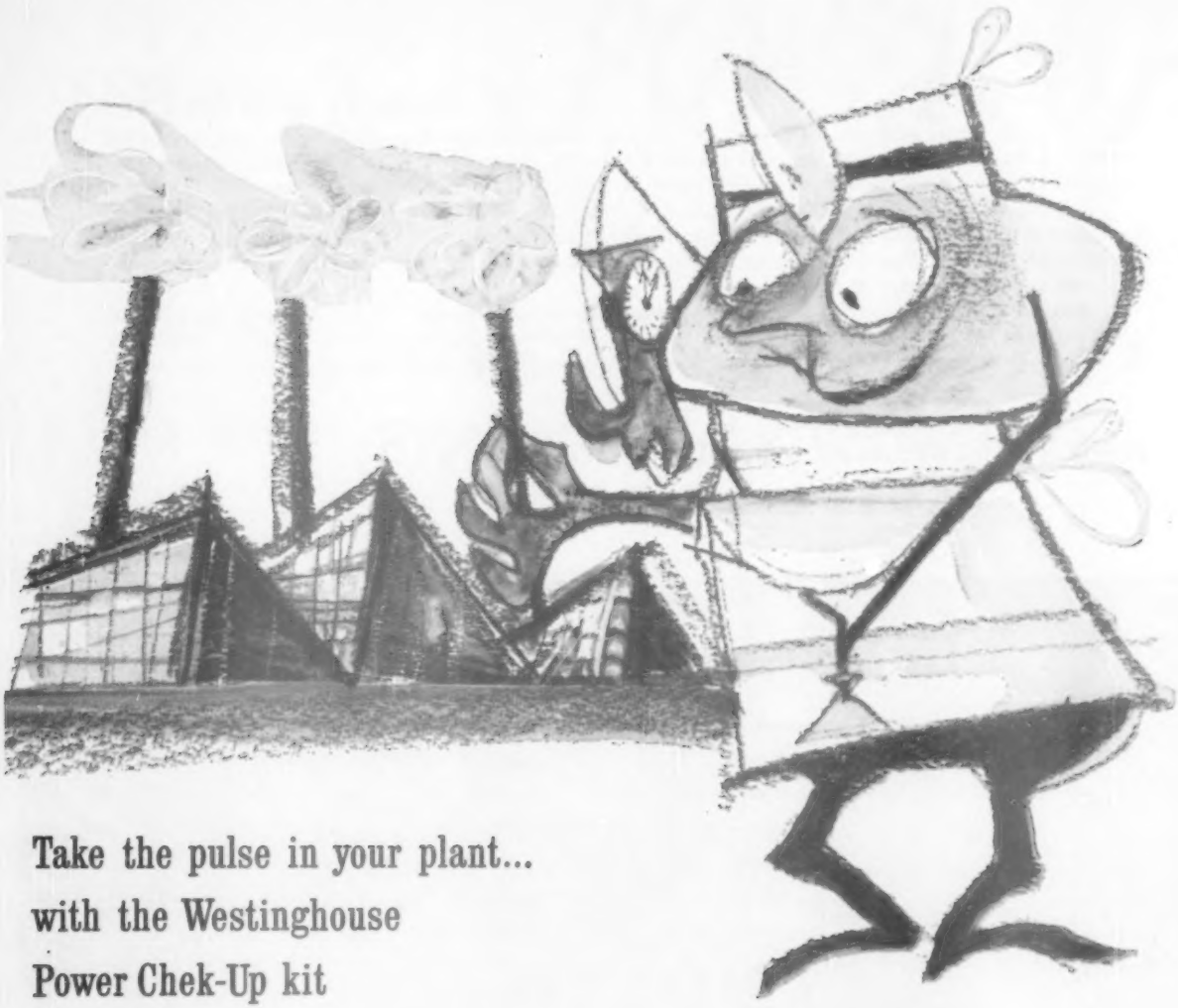
YOU CAN BE SURE...IF IT'S Westinghouse



WESTINGHOUSE AMPGARD* HIGH-VOLTAGE STARTERS with standardized structures and separate power bus (mounted on top) can be grouped together or mounted separately to meet changing production requirements. In any location, operator safety is assured with new isolating switch and segregated high voltage compartments.

*Trade-Mark

WESTINGHOUSE POWER CENTERS at the load are geared for today's production with growth flexibility for tomorrow's requirements. Dry-type power centers eliminate fire hazard. Location close to load shortens secondaries, reduces line loss, gets more work from motors. Quiet operating units are 20 to 40 percent lighter than liquid-filled . . . suitable for easy balcony mounting.



Take the pulse in your plant... with the Westinghouse Power Chek-Up kit

Production problems because of low voltage? Interrupted service? Maintenance costs too high? . . . Then your plant needs an electrical check-up . . . 65% of all plants do! It's easy to see where electrical inadequacy is costing you money when you use the new Westinghouse Power Chek-Up Kit.

The necessary forms, an easy-to-work slide rule and an instruction book are all included. Ask your utility or Westinghouse salesman for details on how to get a kit.

J-96120

YOU CAN BE SURE...IF IT'S Westinghouse

In financial aid to education . . .

What Should Business Do Now?

Now that the federal government is entering the field, should business firms stop giving financial aid to our colleges and universities?

This question is now being discussed by business directors throughout the country. The discussion is prompted by the near-billion-dollar program of federal aid to education passed by Congress a few months ago. For if the federal government, with its access to billions in taxes, is assuming responsibility for the financial welfare of education, should not business get out of the way and let the government take over? This is the general way the question is being asked.

The answer is a resounding NO.

What The Federal Program Does

The new federal program makes it possible for the government to spend the imposing total of $900 million for aid to education over the next four years. There are still many loose ends in the program. But already it's quite clear what such funds will — and will not — do to help relieve the financial plight of our colleges and universities.

First of all, the program is not going to solve any financial problems in education overnight. The program is just barely underway. So far no money has actually been allocated, and Congress has appropriated only $40 million — less than 5% of the total.

More important, there is very little in the total program which will result in direct aid to colleges and universities. The program does set up fellowships to train college teachers. But most of the aid will eventually be channeled through the states to primary and secondary schools. The main focus of the program is education for national defense — strengthening science, mathematics and foreign languages in elementary and secondary schools, together with grants for counseling, testing and research.

The one big item for higher education is a $295 million student loan program, which will help needy students pay tuition and other fees. But tuition rarely covers the full cost to the college of educating a student. So the net result could well be an additional financial strain on our institutions of higher learning.

For the three most pressing financial needs — faculty salaries, scholarship grants and new plant and equipment—colleges and universities must still rely heavily on help from the business community. And it would indeed be a major

misfortune if the recent actions of the government put a blight on this growing and substantial support to higher education.

In the last ten years, business has expanded its financial aid to education by more than four fold. In 1948, contributions were only $24 million. In 1957, such aid reached an estimated $125 million. Moreover, corporations have been putting a larger proportion of their total charitable gifts into education. In 1950, the percentage was only 17%. By pre-Sputnik 1956, the share had already increased to 34%, according to figures recently released by the Council for Financial Aid to Education.

Why Business Must Help

The most compelling reason for increasing business aid to higher education — at an even faster rate—is that our colleges and universities desperately need financial help. It is that simple. Private contributions to higher education must average at least $400 million over the next ten years if our colleges are to meet rising operating costs and raise faculty salaries to decent levels. Despite the growth in business contributions, we are still well below that goal.

If our colleges cannot solve their mounting financial difficulties through voluntary help from business firms, alumni and communities — then it is to be expected that federal aid ultimately will be mobilized in a big way. In principle, if not in dollars, the 85th Congress has paved the way. Indeed, a large federal scholarship program was squeezed out of this year's legislation only in the course of last-minute compromises. And Arthur S. Flemming, Secretary of Health, Education and Welfare, has urged that the next session of Congress restore the scholarship program.

About any federal rescue operation for higher education, two things are quite clear:

(1) **Such aid will come too late to prevent irreparable harm resulting from the current shortage of funds.** The need for help is urgent and immediate.

(2) **With federal taxes taking over half of all corporate income, any federal program in the end will be financed in large part by the business community.**

An Opportunity

So, viewed narrowly, it is in the selfish interest of business firms to aid our colleges and universities now, rather than wait and be forced to pay later on. By doing so, they ensure that business will have a continuing supply of well-trained graduates. They take advantage of the tax laws for charitable contributions which mean the government in effect assumes more than half the cost of business aid to education. And they win gratitude for a voluntary and generous act.

Viewed in the broad public interest, the business community has an opportunity to perform a financial rescue mission in education which could well be the key to successful survival, not only of our present system of higher education, but also of the nation itself.

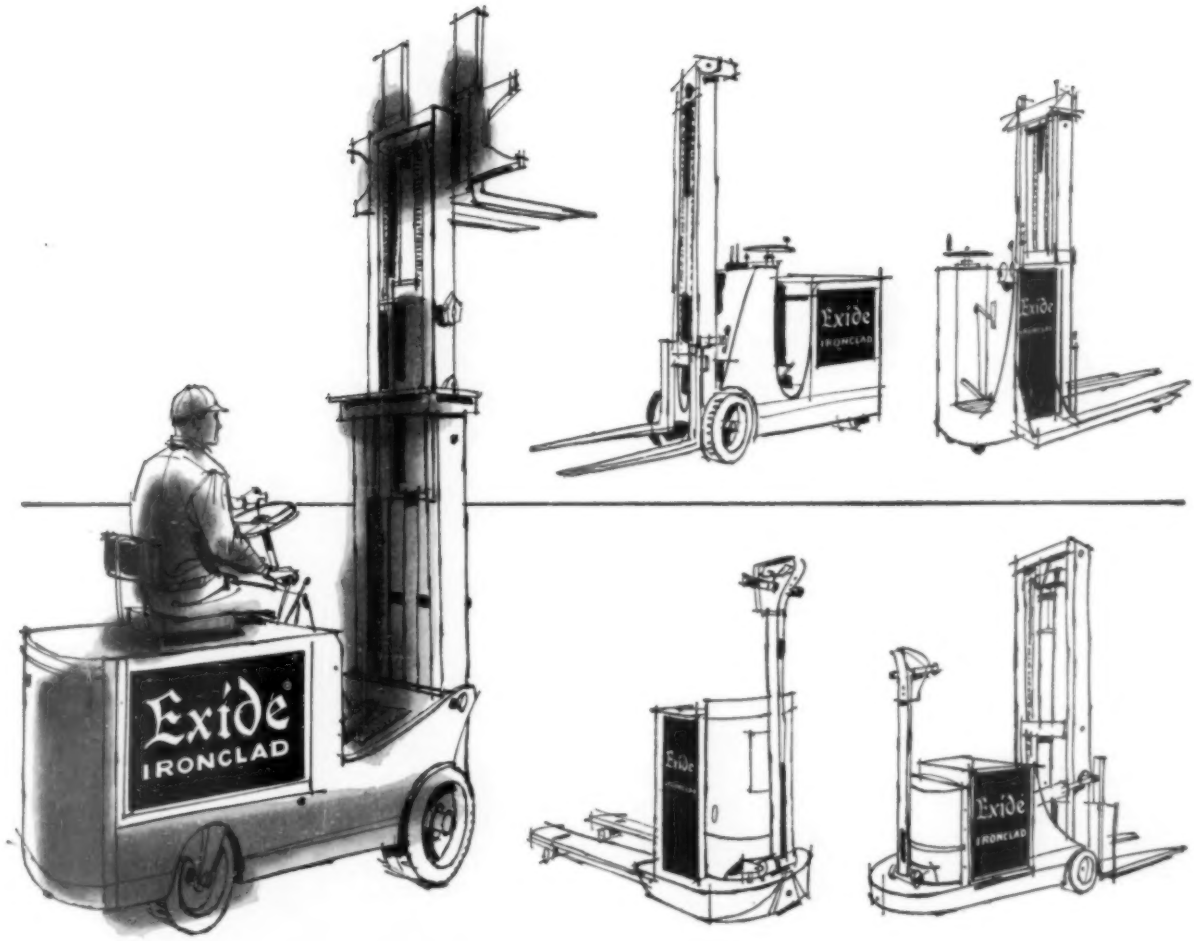
As previous editorials in this series have pointed out, a very small share of the net income of business firms — about 1% — would do the job. Certainly business must not be distracted from this opportunity by the new venture of the federal government in financial aid to education.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nation-wide developments. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C. McGraw

PRESIDENT

McGRAW-HILL PUBLISHING COMPANY, INC.



Now every electric industrial truck can

DO MORE WORK, COST LESS TO USE

New, more powerful Exide-Ironclad Batteries now available in sizes to fit *all* trucks

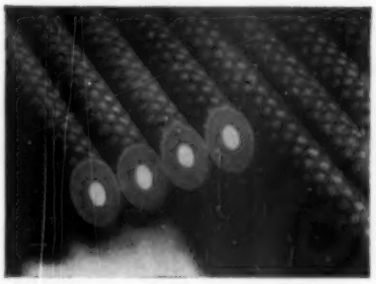
Take any electric industrial truck. Install one of the new higher capacity Exide-Ironclad Batteries and you can get more work out of it at a lower annual cost than you ever did before.

They pack up to 44% more power than batteries in the past. But these new Exide-Ironclad Batteries have the same outer dimensions . . . fit right into your present trucks . . . provide added power so your trucks can lift more, carry it farther, move it faster, make more trips. Yet they actually cost you less per ampere-hour and offer a longer life potential for greater long-range economy.

Save money, too, on applications where you don't need additional power. New Exide-Ironclad Batteries are available in the same capacity as old batteries, but in a more compact size and up to 15% lighter for greater flexibility and at a lower price.

When you buy batteries for your electric industrial trucks, make sure you get all the economy only the new Exide-Ironclad Batteries can offer you. Write for complete details. Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 2, Pa.

Exide®



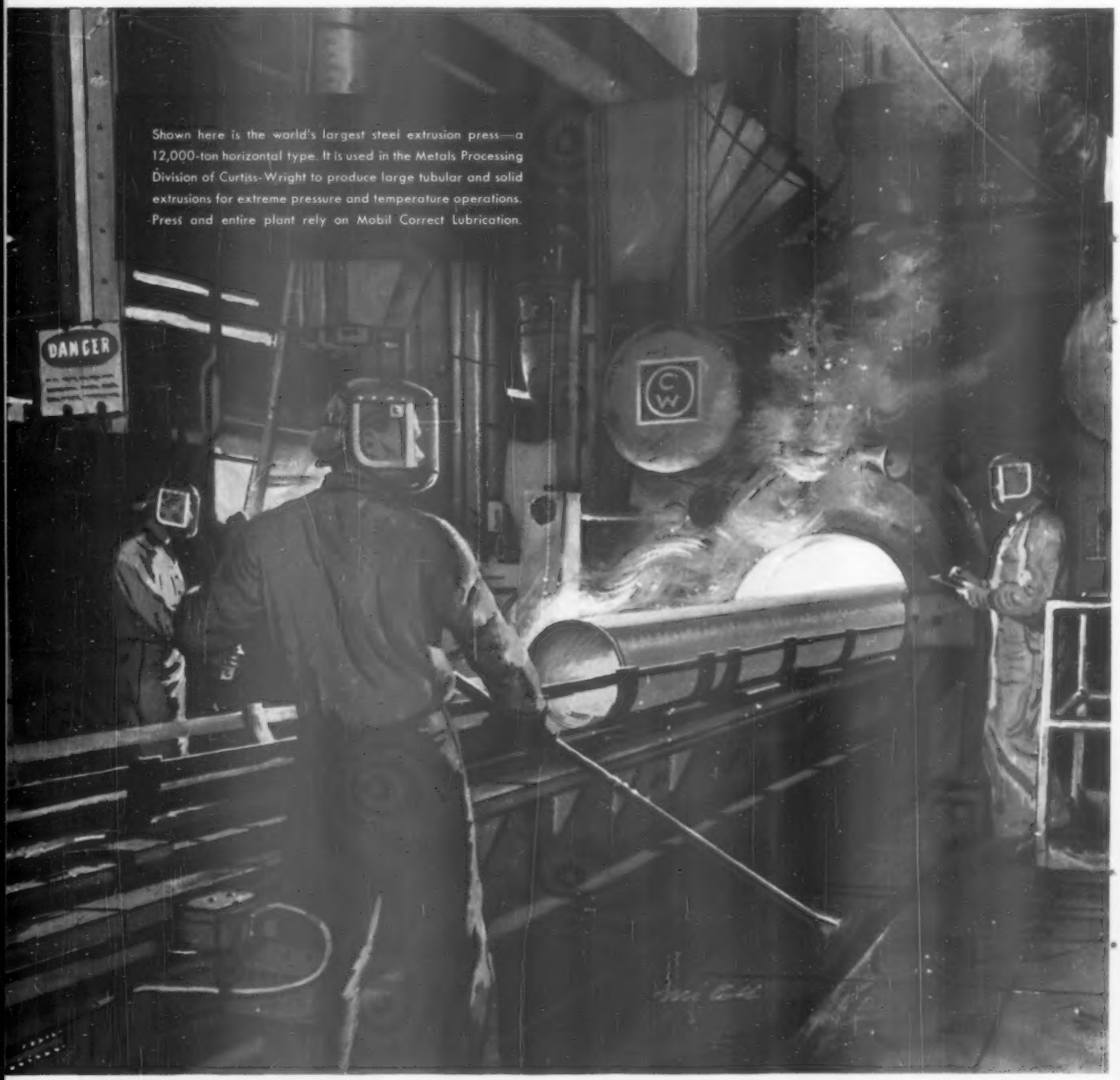
Here's the secret. Unique advanced tubular construction. Every positive plate packs more power. So every battery gives you greater efficiency—a more compact battery for a given capacity rating.

For more facts circle 541 on Reader Service Card

For more facts circle 542 on Reader Service Card

Correct Lubrication in Action...

How Mobil saved



Shown here is the world's largest steel extrusion press—a 12,000-ton horizontal type. It is used in the Metals Processing Division of Curtiss-Wright to produce large tubular and solid extrusions for extreme pressure and temperature operations. Press and entire plant rely on Mobil Correct Lubrication.

Mobil

Complete Engineering Program
Proved Petroleum Products

Mobil

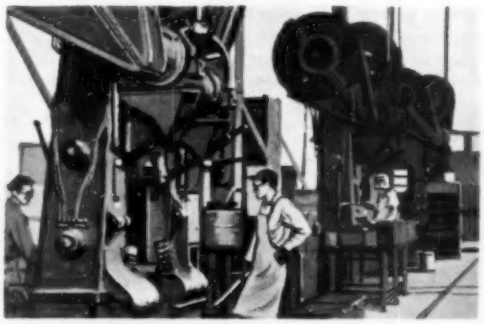
SOCONY MOBIL OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP., MOBIL OVERSEAS OIL CO., INC.

Curtiss-Wright $8,589

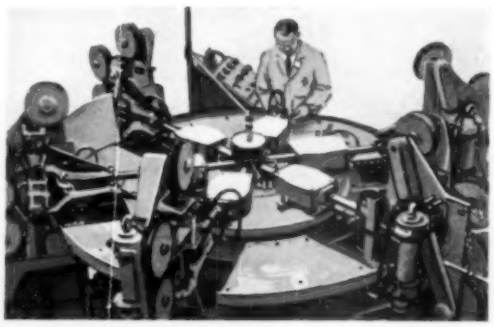
Every time Curtiss-Wright's Metal Processing Division receives a lubricant shipment a big savings is made. Why? Because a Mobil man suggested a new purchasing pattern which brought substantial discounts. Another recommendation saved $1,152 in the company's forging shop.

Here are but two instances of Mobil's imaginative engineering service—an important part of *Correct Lubrication.* Alert, qualified engineers in this plant—*but not on the payroll*—have helped save over $8,589.78 in the last year alone. They have worked closely with Curtiss-Wright engineers, setting up maintenance systems, recommending products and methods that have cut downtime . . . improved production in numerous ways.

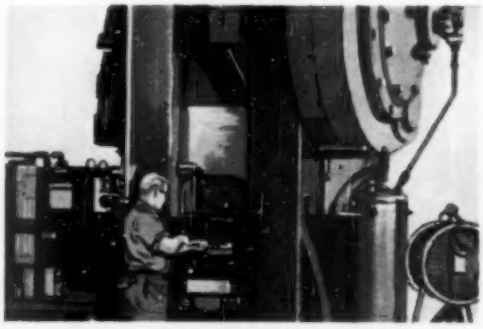
If you purchase lubricants . . . if you're interested in improving company profits . . . it will pay you to investigate Mobil *Correct Lubrication.* This comprehensive lubrication program often more than pays for itself—in profits!



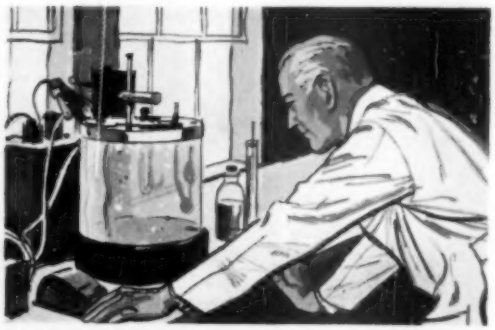
Bearings on drop hammers in Curtiss-Wright's forging shop failed after ten months. Mobil recommended a grease that extended bearing life five years . . . saved $1,152 every ten months.



Curtiss-Wright saves by re-using hydraulic oil as coolant for polishing machine. This saving is part of oil reclamation program organized by Mobil and plant lubrication supervisor. Altogether savings total $5,392 annually.



Bull gears on giant presses required application of grease every week. Mobil recommended improved product that extended application period to monthly intervals . . . cut grease consumption 76% . . . cut application cost $665 per year.



Cooling and lubricating emulsion on cut-off saw broke down into curdly mass. Mobil laboratory analysis pinpointed contamination source. Adding an inexpensive chemical eliminated shutdown and cleaning operation.

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WHY POWER GROOVES? To increase worker efficiency, speed-up production, reduce customer complaints.

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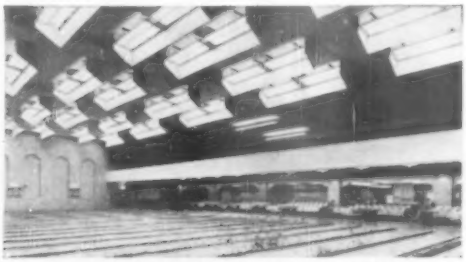
WHY POWER GROOVES? To get the lowest operating cost compared to filament and mercury, and the highest level of light per watt.



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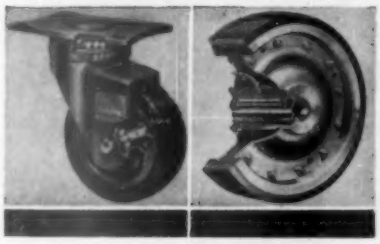

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FACTORY
MANAGEMENT AND MAINTENANCE

LABOR RELATIONS NEWS

By PAUL A. KING, Attorney, Bigelow-Sanford Carpet Company, Inc., Member, New York Bar

Clear Rules for Representation Elections

Today the NLRB is handing down decisions that help define its position on certain important matters—representation elections included.

Until now, if your industry was accustomed to 3-, 4-, or 5-year contracts, the National Labor Relations Board would bar a third party from petitioning for a representation election for the entire term. That's all over. From now on, no contract, however long, will bar an election for more than the first two years—no if's, and's, or but's. Furthermore, if your contract is of indefinite duration, it will not act as a bar for any period. The two-year bar previously applied in such cases is *out*.

The NLRB has also cleared away some of the fog that has always drifted over union security provisions. An illegal clause, of course, never was a proper basis for barring an election. But the big question always was: To what lengths should an employer go to prove a questionable clause illegal?

The new rule on the subject is: "A contract containing a union-security clause which does not on its face conform . . . or which has been found to be unlawful in an unfair labor practice proceeding will not bar an election." Some examples of illegal clauses:

- Requiring the employer to give preference to union members on hiring, seniority, wages, tenure.
- Giving the union unlawful control of these items.
- Requiring employees to do anything more than pay union initiation fees and dues.

Suppose your contract has a legal clause barring an election within a stated time. This may not be an election bar if:

- A majority of the employees vote to rescind a union-shop arrangement within a year prior to the making of the contract.
- Either the local or the international have not complied with the filing provisions of Taft-Hartley.

Another exception to the two-year-contract bar rule: where there is a schism in the union. "The initial consideration is a determination of the factors necessary to a finding that a schism exists warranting an election," said the Board.

The first factor necessary is an intra-union conflict. Such a conflict is "any conflict over policy at the highest level of an international union . . . which results in a disruption of existing intra-union relationships." This will include the disaffiliation or expulsion of an international from the federation, or the affiliation of some officials of an international to a rival organization.

A second needed factor is confusion and conflict in the local unit which can be dissipated only through an election. Factor three is an opportunity for the employees "to exercise their judgment on the merits of the conflict." Factor four, the change of representatives must be "taken within a reasonable period of time after the occurrence of the conflict."

Granted that a contract is not a bar, when is an election "timely"? Where there is a conflict, as mentioned above, it must be soon after the action that caused the conflict. But apart from that, petitions filed within 60 days of a contract's expiration are not timely. Petitions filed more than 150 days before expiration are not good either.

Another new rule: A contract will not bar an election if entered into despite a "substantial" representation claim of another union.

Other recent contract rules issued by the Board:

- There's no election bar if the contract was signed by the employer and the present union after an election petition was filed by a rival union.
- There's no election bar if a contract was signed but not ratified by the rank and file before the petition is filed. Exception: the contract does not expressly call for such ratification.
- There's no election bar if the contract is confined to wages. But there must be a full-fledged substantial contract.
- There's no election bar if the employees taken on before the contract signing number less than 30% of those on the payroll at the time of the hearing.
- There's no election bar if the job classifications when the contract was signed are less than 50% of those in effect at the time of hearing.

Careful Rule-Making

An arbitrator taught this company to cross its T's and dot its I's when it drafts rules.

The company rule: All employees must submit to an inspection of their cars before leaving the company parking lot. The problem: One employee refused to open his car trunk for inspection as the others did. He volunteered to turn his keys over to the guard and suggested the guard do it. He was suspended for insubordination. The decision: The arbitrator ruled that the notice required employees to submit to inspection. Didn't say they must open their trunks. The man was not guilty of insubordination.

Turn the page

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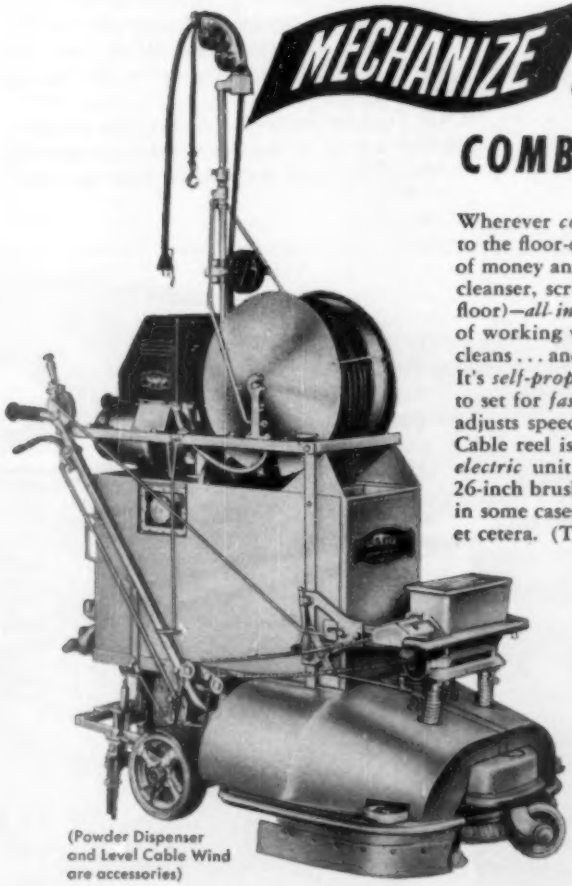

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Finnell makes *Scrubber-Vac Machines* in a full range of sizes, and *gasoline* or *propane powered* as well as *electric* models. From this complete line, you can choose the size and model that's exactly right for *your* job (no need to *over-buy* or *under-buy*). It's also good to know that *a Finnell Floor Specialist and Engineer is nearby* to help train your maintenance operators in the proper use of the machine . . . to recommend cleaning schedules for most effectual care . . . and to make periodic check-ups. For demonstration, consultation, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 2512 East Street, Elkhart, Indiana. Branch Offices in all principal cities of the United States and Canada.

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Buying Out a Competitor

When one company buys out another company and takes over its employees, the seniority lists are merged.

One Georgia trucker bought out another. If he could have his way, he would put the names of the newly acquired employees at the bottom of this list. So would his employees. But one union represented both groups of employees and it insisted that for justice to prevail the two lists should be integrated. The employees of the buying company, less interested in justice and more interested in job security, took both the company and the union to court. The court supported the union's view. It contended that the union represents the best interests of all the employees and not of any one group.

Layoffs Get Holiday Pay

This award compelled an employer to give laid-off employees Christmas and New Year's pay.

It was December and Ottumwa Foundry had to lay off several employees for several weeks. In early January they were recalled. Christmas and New Year's day fell in the lay-off period.

We want pay for these two days, fumed the laid-offs. You're not entitled to it under the contract, responded Ottumwa, waving the document in the breeze and quoting its clause that employees get holiday pay only if they worked on the last scheduled workday before the holiday and the first after the holiday.

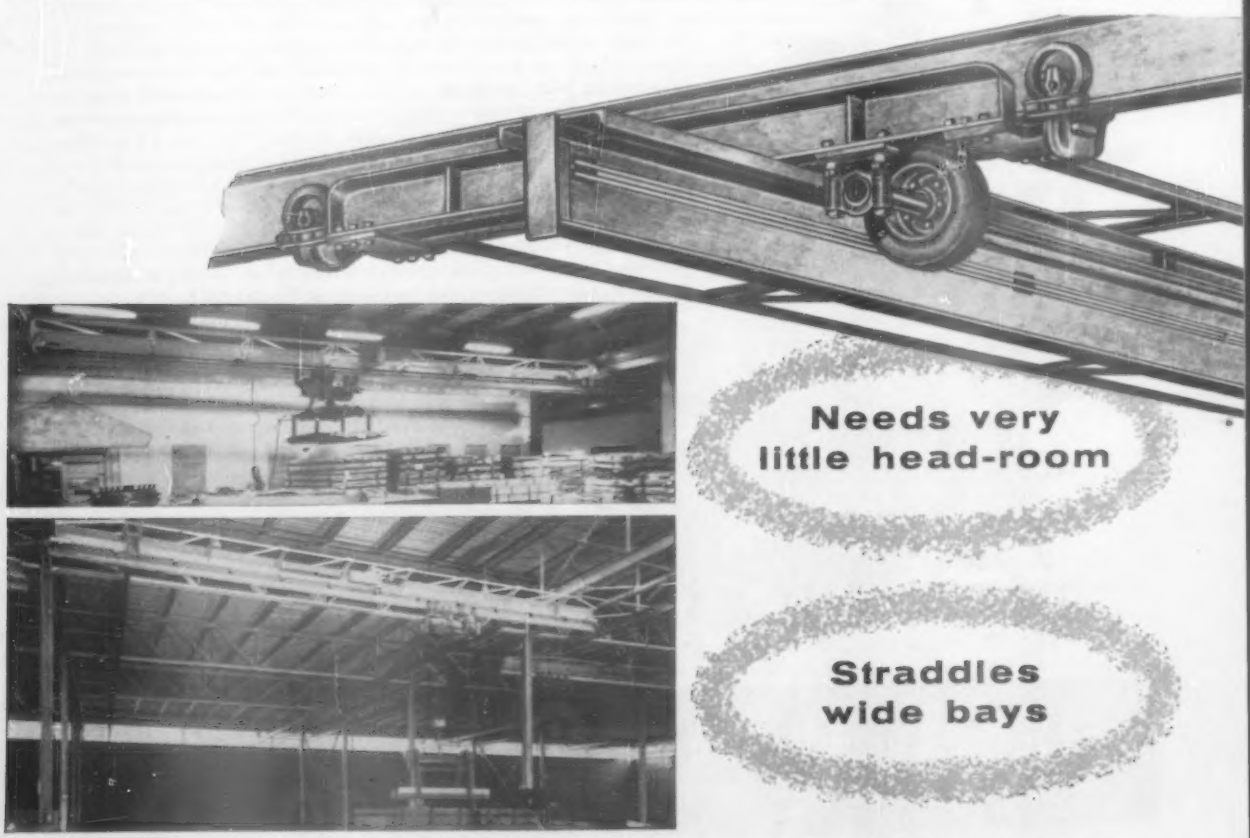
Arbitrator James A. Doyle sided with the employees. He felt the employees had worked their scheduled workday before and after the holiday. They worked on the day of layoff, returned the first day of recall.

Rules Should Be Written

An employer is guilty of an unfair labor practice if he refuses to turn over a copy of the company rules to the union.

This union became fed up. Claimed that "every time we turned around" some employee was being fired for violating a company rule. Let's have a copy of all the rules, the union demanded, so we know where we stand. The company had rules but all of them were not written down. It feared that if it turned over some of the rules, that is, failed to turn over every last one of them, the company would, in effect, be giving up its right to enforce those not turned over.

An NLRB Trial Examiner ruled that the company had to turn over a copy of its rules whether presently in writing or not. The union needed the rules to decide



whether or not they ouught to bargain on them when the contract expired in a few months. They also needed the rules to properly administer the contract. The Examiner ruled this way despite the contract clause which read: "The company shall be permitted to make and enforce such shop rules as it deems advisable which do not abrogate any provisions of this agreement."

Bad Faith Bargaining—Defined

This employer unsuccessfully tried to foist financial responsibility on the international for violations of a no-strike clause by the local.

The negotiator for the North Carolina Furniture Company insisted that the union contract contain a clause making the international financially responsible for the no-strike agreement of the local. Insistence on this clause is an unfair labor practice—a refusal to bargain—ruled the NLRB.

Look here, said the employer, the local has no assets. What good is its no-strike clause? Moreover, the international organized the workers, gets a share of the dues, was present at all negotiation sessions.

The NLRB put it this way. Employer and union *must* bargain about "wages, hours, and other terms and conditions of employment." The NLRA says so. Any insistence on a provision not in this category is bad faith bargaining, and the kind of clause demanded by the company in this case was not in the category.

No Hidden Testimony

Pre-trial statements to NLRB general counsel by witnesses must be made available to the accused.

Some time ago, the U. S. Supreme Court ruled (in the Jencks case—a federal criminal case) that opposing counsel has the right to inspect pre-trial statements made to the FBI by a witness. The first time a similar problem came up before the NLRB it said that the Jencks rule would not apply to NLRB proceedings. But now the board reverses itself and states that pre-trial statements to NLRB general counsel by adverse witnesses are available to the party accused of an unfair labor practice.

Legitimate Expense?

Employee expense account items subject to doubt don't justify maximum penalties.

Breathes there a salesman with soul so dead he has never padded an expense account? But when a rank-and-filer gets a chance to engage in this nefarious but profitable practice, it's news—particularly when the whole thing comes up before an arbitrator.

This employee was given a job away from home. Each day for 12 days, he added 50¢ to his expense account. When he felt that the company had caught on, he tried to get an additional bill from the hotel to cover up. When put on the carpet, he alibied that the extra

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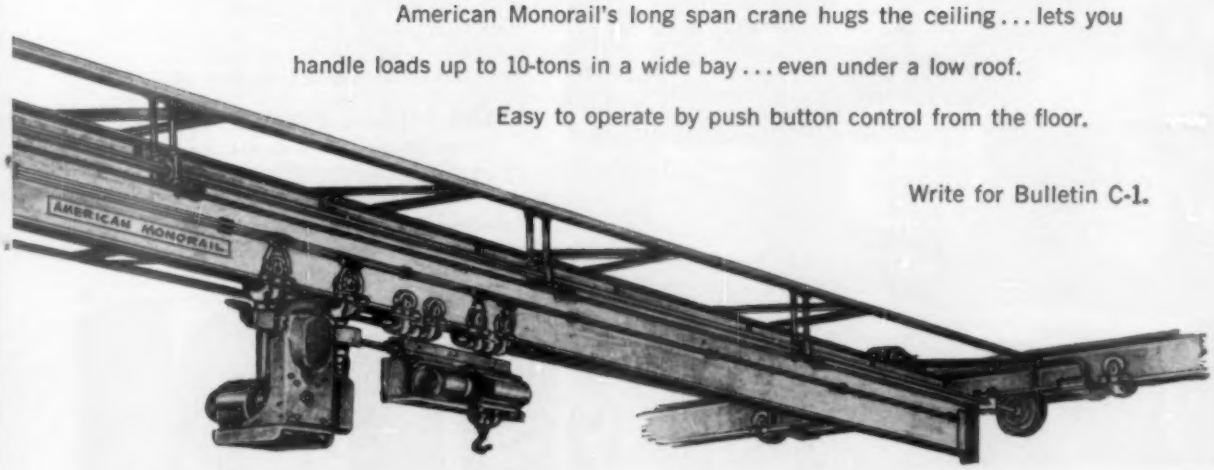

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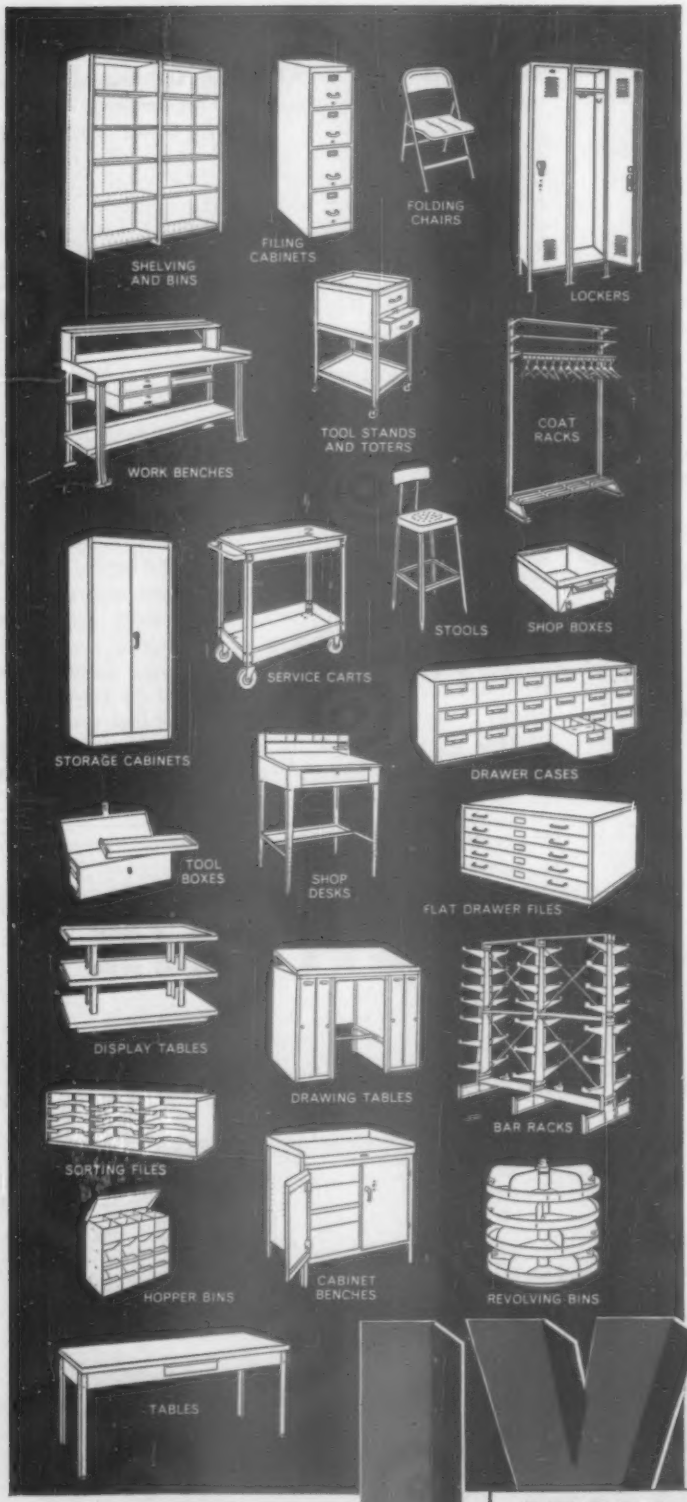

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50¢-items were supposed to repay him for the daily coin television usage. To no avail. He was canned.

The arbitrator reinstated him as of the day the award was handed down. Saw nothing terrible in the employee's using this method of recouping a legitimate cost. But the question was: Was this a legitimate cost? As to this, there was doubt.

Because of the doubt, the arbitrator felt that discharge was too harsh a penalty.

Stock Discounts Are Wages

Stock plan discounts are a form of wages, therefore are a subject for collective bargaining.

In the Richfield Oil case, the court ruled that an employee stock purchase plan is a subject for collective bargaining. But there the company contributed to the price of the stock. Does it change the situation where the company kicks in nothing?

The Westinghouse Electric Corporation thought it did. Considered it took it out of the realm of collective bargaining. An NLRB Trial Examiner thought otherwise. Westinghouse sold the stock to employees at a discount ranging from 8 to 13% of the market price. That was all it did. The Examiner decided that the discount was "an emolument of value and thus wages within the meaning of the Act as found in Richfield Oil . . . It is a discount given to the employees on the purchase of its stock . . . and is no less valuable to the employees whether it comes from the company's cash reserve or other assets."

* * *

Labor relations guide. For laymen—a 300-page "Guide to Labor Relations in the United States" has been published by the Bureau of Labor Statistics. It's available from your local BLS office for $2, covers trade union activities in the U.S. Also includes a glossary of terms currently used in industrial relations.

Data for unions. Company pension and insurance program facts come within the orbit of the data that unions have the right to ask for. The NLRB general counsel ordered a multi-plant employer to furnish such data to a union certified for one of its plants despite the employer's contention that it was opposed to having a plan for just one plant.

Moving expenses are taxable. Moving expenses paid to new employees who must relocate are taxable income to them, ruled the Federal Circuit Court of Appeals for the 10th Circuit. And if they pay their own moving expenses, they cannot deduct them as business expenses.

Pension plans digest. For 45¢ the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., will send you a digest of 100 selected union-negotiated pension plans. Each plan covers over 1000 workers. The collection was put together by the U. S. Department of Labor.

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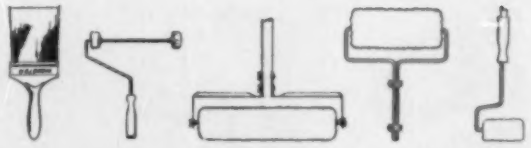

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—Mr. Darrell Kemler, Maintenance Foreman,
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"There's always a mist of oil around each of our 28 wire-straightening and cut-off machines," states Darrell Kemler, Maintenance Foreman for Union Steel Products Company. "That's why ordinary V-Belts won't last more than 5 to 7 days and why we were spending an average of $700 a week just to replace V-Belts that were stretching, slipping and finally breaking.

"That was three years ago, before we switched to oil-resistant Dayton Cog-Belts. The life of a Cog-Belt? It's 24 hours a day, 5 days a week, for an average of seven months ... or at least 2000% longer than any V-Belt we've used before.

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"As soon as we'd switched to surer-gripping Dayton Cog-Belts we found they increased production by maintaining constant torque. That's important because we must maintain a constant ratio between arbor speed and wire feed. When belts slip, the wire can't be straightened, or worse, we get galled wire which is seldom detected until after the product is assembled and plated. Obviously, all this defective material ends up in the scrap pile.

"Part of the tremendous success we've had with all kinds of Dayton V-Belts is due to the training and trouble-shooting help that Dayton gives us. Through meetings, trouble-shooting clinics, motion pictures and demonstrations, all our men have learned the proper way to use and install V-Belts and how to analyze power transmission problems. We feel the Dayton Preventive Maintenance Program saves us hundreds of dollars."

For more information and help in solving your power transmission problems, see BELTING in the Yellow Pages for the name and phone number of your nearest Dayton Distributor. Or write the Dayton Rubber Company, Industrial Replacement Division Dayton 1, Ohio.

*T.M.

"Here's a Cog-Belt on the wire-straightening and cut-off machine that is constantly sprayed with oil. Still, it gives us seven months service without slipping where another belt would fail in a week."

Shown (l. to r.) with Mr. Kemler are Mr. Ernest Weber of Kendall Hardware-Mill Supply Co., who first recommended Cog-Belts, and Ross Annatoyn, the Dayton Rubber Co. representative.

"No other belt can touch the efficiency of Dayton Cog-Belts. We use them on this eccentric cam-operated basket trimmer because of their sure-gripping die-cut edges and their ability to transmit up to 40% more horsepower without slipping."

Dayton Rubber *World's Largest Manufacturer of V-Belts*

THE DAYTON RUBBER COMPANY • INDUSTRIAL DIVISION • DAYTON 1, OHIO

For more facts Circle 550 on Reader Service Card

FACTORY
MANAGEMENT AND MAINTENANCE

HUMAN RELATIONS

By GEORGE A. HOY, JR., Industrial Management Editor, FACTORY

Artist's Autograph

"Custom built by John Jones, master tire builder." That's the message stamped in silver on the sidewall of every super-silent safety tire built at Gates Rubber Company, Denver. Of course the signature isn't John Jones's. It's any one of 17 signatures of the top craftsmen who build this particular tire.

The stamped-on silver credit line may eventually wear off the tire. But its effect will be a long time wearing off the mind of John Jones. Like the actor's name in lights, it's tangible evidence that he has value, means something to other people. And he's right, because you can bet the customers who buy these tires have special confidence in the product because of John Jones's signature.

File Those Worries Away

If you have a worry cloud, you have plenty of company, says Vision, Incorporated, New York. At least 75% of the world's population suffers with you. You can't actually stuff worries in a file drawer—like the man above. But here are two ideas:

One good way to ease the burden of worry is the opposite of usual good mental health advice. The technique is to procrastinate—save your worries for one particular day. Let's say you designate Wednesday to be your worry day. Whenever a worry appears, you simply write it down, file it until an established time on Wednesday. When that time comes, you get out all the worries, discard those that have been settled, refile those that have not.

Another technique for combating worry is to displace it with constructive thought. Theory is that two lines of thought can't occupy the same mind at the same time. If you have a constructive project to absorb your thoughts, worry loses the battle for your attention.

These are tricks. They may help you. And they may help your subordinates if you have any who are wan from worry.

Hazardous Handling

One out of every four work injuries, claims W. J. Byrne of Walter J. Byrne & Company (New York), stems from materials handling. That makes materials handling the biggest single contributor to work accidents and injuries in industry.

Updating the Engineer

Smarter engineers will emerge from a nine-week full-time course in communications and electronics developed by New York Telephone Company. Reason for the program, phone company Staff Engineer C. E. Waldner told the American Institute of Electrical Engineers, is that "changing and advancing technology makes a formal education out of date in just a few years." About 200 engineers will be trained in the program. It's conducted at Cornell University. Students are fed, housed, educated on campus.

Here are three top features of the program. You might include them in your own training procedures:

- Achievement tests are given to all engineers proposed for the program. Those who lack prerequisite knowledge get special advanced training before entering the Cornell program.
- Retired engineers are filling the vacuum of qualified instructors. There are plenty of talented retirees around, and they do a fine job.
- Managers get an "appreciation course" to keep them abreast of what their staff is learning.

Don't limit your thinking to engineers. Maintenance craftsmen, production men, inspectors, and supervisors also suffer from technical knowledge obsolescence. Smart training is the answer.

Wanted: Dual Personality

The much-sought man of the near future is a scientist or technical man with executive ability. The demand upsurge will start next year, be in high gear by '65, according to Hoff, Canny, Bowen & Associates, Inc., New York executive placement specialists.

Information comes from a survey of 612 corporations. Here are some additional survey results:

- Over three-quarters of the companies feel they have difficulty finding top technical people who are equally strong in administrative skills.
- The three most needed technical backgrounds are mechanical and industrial engineering and chemistry.
- Chemistry, electronics, and atomic energy are fields now offering the greatest financial rewards.
- Almost three-fifths of the companies have some special incentives to hold and attract technical executives. Typical incentives: high salaries, liberal fringe benefits, opportunities for advancement.

Some economists feel that demand for this type of personnel is a sensitive indicator of swings in the economy. If so, boom times are on the way.

Not Wanted: Jargon

Big problem in arbitration, says an editorial in the *American Arbitration Association Journal,* is a growing superstructure of legal trappings. The editorial quotes New York University's Professor Emanuel Stein, a well-known arbitrator, as follows: "A frustrating kind of legalism has crept into labor relations because the arbitrator has come to function like a judge and the parties have come to treat arbitration like litigation . . . This is wrong. Arbitrators are supposed to make their decisions on the basis of merit, not precedent."

And so it goes, continued the editorial. Some arbitrators burden their written opinions with numerous citations to support self-evident conclusions. Others regretfully report that they cannot find any published case similar to the one before them.

This is not a problem with all arbitrators—or even with the majority. It's a problem for a relatively small minority.

So what, you ask? Two things. First, you can help put the arbitration process back on its common-sense feet by putting your argument in common-sense terms rather than in legal jargon. Second, you can avoid the would-be wig-wearers like the plague.

Hula Break

"What next?" was veteran FACTORY editor Carl Wyder's wry comment as he passed along notice of this new employee practice:

It seems that employees (mostly women) of the Barmon Brothers Company, Inc. (Chicago), take two breaks every day, morning and afternoon. Do they head for the coffee? No. Do they dive for the lunchbucket? No. Do they relax, talk quietly? No. They solve the fatigue and boredom bugaboo by gyrating their hula hoops.

What next? Who knows?

Integrated Labor Gains

School headlines raise the question, "What's the score for integration in Southern industry?" A two-year study by eight AFL-CIO unions in cooperation with the national labor service of the American Jewish Committee sheds some light. The survey report suggests a difference between school and labor integration problems: Southern workers are moving "gradually but steadily toward effective integration."

Duet With a Message

The town is Weirton, W. Va. The company is the biggest in town—Weirton Steel Company. The two know their safety objectives are as interdependent as the two ends of a U-bolt.

In 1956 town and company joined forces to promote their first big Safety Week. Its purpose: to reach all the people that must cooperate if a town, neighborhood, home, or plant is to be safe. Everyone pitched in—city council, traffic commissioner, company representatives, police and fire chiefs, chamber of commerce. Every civic and plant organization got behind the drive. It was a huge success. As was the third annual drive just completed.

In fact, this year's campaign was better than the first. It left no room for mix-ups. Not so in 1956. That year one resident lamented, "Safety week sure got off to a bad start." He had seen a badly smashed car at every key intersection. The smashed cars were placed there as part of the campaign to impress motorists. But this witness thought the big week had started with a rash of wrecks.

CATALOG NEWS

For more about these items, circle numbers on Reader Service Card next to back cover.

INSTRUMENTS AND CONTROLS

1—Manometers. Instruments for measuring pressure and vacuum are explained in Catalog No. 2008 (24 pages). Includes sections on U-type, well-type and other manometers, and accessory equipment. Photos. *King Engineering Corp.*

2—Testing Instruments. Sixty different testers or equipment are illustrated and described in this 12-page catalog (No. 59). Products include instruments for use in adhesives, metals, other fields. *Custom Scientific Instruments, Inc.*

3—Drum-Type Controllers. This 8-pager describes construction of drum, its operation, combination timers. Includes installation dimensions, specs; explains special features of devices. Photos, drawings. *Seely Instrument Co., Inc.*

4—Timers. Here's an 8-pager with photos and diagrams of recycling cam, multi-cam, single-cycle multi-cam, interval, time delay, other timers. Includes gear rack chart, time cycle and calibration tables. *Industrial Timer Corp.*

5—Test Equipment. Bulletin 2060 has 8 pages of info about test equipment for electronic, electrical, air conditioning, and heating applications. Testers include volt-ohmmeters, microtesters, other products. *Simpson Electric Co.*

6—Process Instruments. This 52-pager (No. 2) covers indicators, transmitters, records, and controllers for flow, pressure, temperature, density, viscosity, and consistency. *Fischer & Porter Co.*

7—Gages. Catalog NR-198 (40 pages) covers over 250 different gage models—pressure, vacuum, compound, pneumatic and electric transmitter, receiver, test gages; also accessories. Specs, applications. *International Register Co.*

8—Recorders, Panel Instruments. Two bulletins: GEA-6792 (12 pages) on single and multi-point, strip and round chart recorders, controllers, indicators; GEA-6678 (6 pages) on d-c/a-c small panel instruments. *General Electric Co.*

9—Electron Optics. Here's a 16-page booklet (RC178A) that illustrates and describes microscopes and microradiographic unit. Instruments are especially useful for inspection and test applications. *Philips Electronics, Inc.*

MATERIALS HANDLING

10—Conveyors. This 8-page bulletin (RSK-1) presents info on power and free trolley conveyor systems. Also covers remote panel controls used in conjunction with automatic system. Photos show applications. *Conveyor Systems, Inc.*

11—Automatic Feeders. Here's an illustrated brochure (Form 3R3384) that describes parts feeders and orientors. Shows high speed hardness testers, inspection machines, grinder controls, other products. *Radio Corp. of America.*

12—Packaged Conveyor Units. Stationary and portable units for horizontal or inclined conveying are discussed in a 52-page file folder. Includes info on accessories, with photos, drawings, weight tables. *Harry J. Ferguson Co.*

13—Equipment Leasing. Three methods of leasing materials handling equipment are explained in 4-pager; monthly rental payments are outlined. Standard plans "tailored" to meet special requirements. *Lewis-Shepard Products, Inc.*

14—Overhead Conveyors. Bulletin RK-58, an 8-pager, presents applications that show overhead conveyors for warehousing, order selection, storage, and other uses. Info on power-push and monorail systems. *Rapistan-Keystone, Inc.*

15—Fork Lift Truck. "Heel and toe" is not a dance but a new method of operating lift trucks. Instant power application does it—hands are free to steer or run lift because shifting mechanism has been eliminated. *Towmotor Corp.*

16—Conveyor Belts, Wire Cloth. How woven wire conveyor belts aid automation is described in illustrated Bulletin No. 111 (4 pages). Also use of woven wire for filtration, sizing, screening, dewatering. *Cambridge Wire Cloth Co.*

17—Air Hoists. This 4-pager (Form 5852-1) describes half-ton and one-ton link and roller chain, hook and trolley mount, cable and pendent control, standard and extra fast hoists. Photos of hoists and accessories. *Aro Equipment Corp.*

18—Fork Lift Trucks. Advantages of 2000-lb. trucks powered by heavy-duty engine with 35 brake hp. at 2400 rpm. are set forth in 8-page catalog (BU-485). Specs, capacity charts, diagrams, application photos. *Allis-Chalmers Mfg. Co.*

AUXILIARY

19—Adjustable Pumps. Data on pumps for handling liquids or hygroscopic solids in suspension are contained in 8-pager (No. 08B9050). Design details, power curves, capacities. *Allis-Chalmers Mfg. Co.*

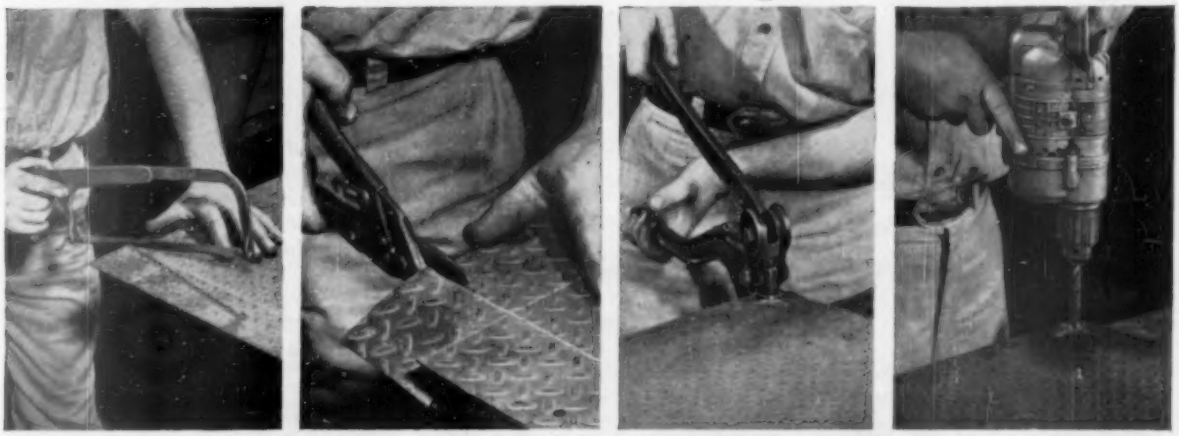
20—Centrifugal Compressors. This 20-page illustrated bulletin (No. 909) describes construction and operating features of compressors and lists applications. Also discusses compressor controls. *American-Standard, American Blower Div.*

21—Infra-Red Heater takes that winter nip out of the air. Maker suggests 'em for grandstands and sidewalk cafes. We think you'll want for loading docks, employee entrances, cold spots in high-bay areas, etc. *Quartz Products Corp.*

Turn the page

ORDINARY SHOP TOOLS

can cut, bend, hammer, drill, shape, roll saw, snip



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Small Pattern 4-WAY SAFETY PLATE is only 18 gage, weighs only 2.4 pounds per square foot, yet has all the slip-resistant traction and safety features that has made regular 4-WAY SAFETY PLATE famous. Small Pattern 4-WAY costs less to use—less per square foot covered—than other similar materials.

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For more facts Circle 551 on Reader Service Card

For more about these items, circle numbers on Reader Service Card next to back cover.

22—Sump Pumps. Bulletin No. 4500-B is a newly revised 16-pager that presents facts about single and duplex pumps. Includes installation, horsepower, dimensional data, optional control equipment info. Photos and diagrams. *Deming Co.*

23—Compressors. Here's an 8-page bulletin (A-95) that gives complete rundown, with illustrations, for heavy-duty, low-pressure compressors and parts. Has specs for three models from 756 to 7392 cfm. Drawing, photos. *Joy Mfg. Co.*

24—Gas-Fired Unit Heaters. Instantaneous heat from a cold start and effective air distribution at low noise level are two advantages of heaters described in Catalog No. 58 (8 pages). Sound ratings, specs, and photos. *Grinnell Corp.*

25—Heavy-Duty Draft Fans. Catalog No. 1361, an 8-pager, tells about centrifugal fans for handling abrasive gases at elevated levels. Has application and performance data, accessories info, and photos. *Westinghouse Electric Corp.*

MAINTENANCE

26—Aerosol Spray Products. What aerosol is and its many uses are explained in a 16-page catalog (Form 3547). Products include rust inhibitor, tool makers' ink and cleaning oil, multi-purpose grease, paint. *Crown Industrial Products Co.*

27—Shop Equipment. Here's a 52-page catalog (No. 59) that tells all about power tools, including new belt sander, saws, cutters, grinders, lathes, supplies, and accessories. Has photos, specs, and dimension tables. *Boice-Crane Co.*

28—Wood Block Floor Care. Recommended practices to assure low maintenance costs for interior and exterior installations are given in this illustrated 4-pager. Includes helpful tips on reconditioning old floors. *Jennison-Wright Corp.*

29—Maintenance Repair Products. Application Bulletin No. 3 (8 pages) describes plastic steel and other products for maintenance and repairs. Plastic steel mixed with hardener bonds steel, bronze, wood, other materials. *Devcon Corp.*

30—Jet Cleaners. Bulletin No. 424-B (8 pages) discusses hydraulic jet models for heavy-duty cleaning of walls, floors, or process equipment. Cleaners come in portable and stationary types. Specs, photos. *Sellers Injector Corp.*

31—Power Tools. This 4-pager (No. P.O.-47769) covers electromagnetic electric hammers, drills, saws, paving breakers and concrete working tools, and vibrators. Specs, applications. *Syntron Co.*

PRODUCTION

32—Welding Accessories. This 52-page catalog (ADC848C) contains info on arc and gas welding supplies and accessories. Includes over a hundred photos, drawings, specs, chemical analyses, other technical data. *Air Reduction Sales Co.*

33—Drum Dryers. Mechanical and other details of atmospheric and vacuum dryers equipped with either single or double drums are given in Bulletin No. 384 (28 pages). Photos of applications, table of specs and dimensions. *Blaw-Knox Co.*

34—Power Tools. Catalog AB-58-2, an 88-pager, describes drill presses, grinders, shapers, metal and wood cutting lathes, other tools. Applications include maintenance jobs as well as production. Specs for all accessories. *Rockwell Mfg. Co.*

35—Torches. Here's a 4-page catalog (HT-1) that presents info on gas-fired, spear flame hand torches. Photos of plain hose and valve hose connection series; drawings of single and multiple torch operations. *Selas Corp. of America.*

36—Drilling and Tapping Machines. Two illustrated catalogs: No. 615 has data on vertical hydraulic machines in 12-, 18- and 24-in. widths. No. 619 describes horizontal hydraulic feed units for drilling, tapping. *Baker Brothers, Inc.*

37—Welding, Cutting Equipment. Catalog No. 586, 32 pages, covers welding and cutting apparatus, including torches, tips, regulators, accessories. Technical data, tables of sizes, photos, and drawings. *Harris Calorific Co.*

38—Metal Center Buffs. New buffs that are said to run cooler and last longer are described in an 8-page folder. Cross-section shows construction of air-cooled buff. Provides specs, other information. Photos. *Divine Brothers Co.*

39—Cutting Machines. "Save floor space, time, and labor," says maker about line of cut-off saws shown in pocket-size, 36-page illustrated booklet. See the "see-saw," "roll-around," and "monster" models. *Wallace Supplies Mfg. Co.*

40—Assembly Machine. **Bulletin** AP-B2 is a 4-pager that describes an auto-positioner said to save time and simplify small parts assembly operations. Shows four models and parts being handled by new feeder. *Dixon Automatic Tool, Inc.*

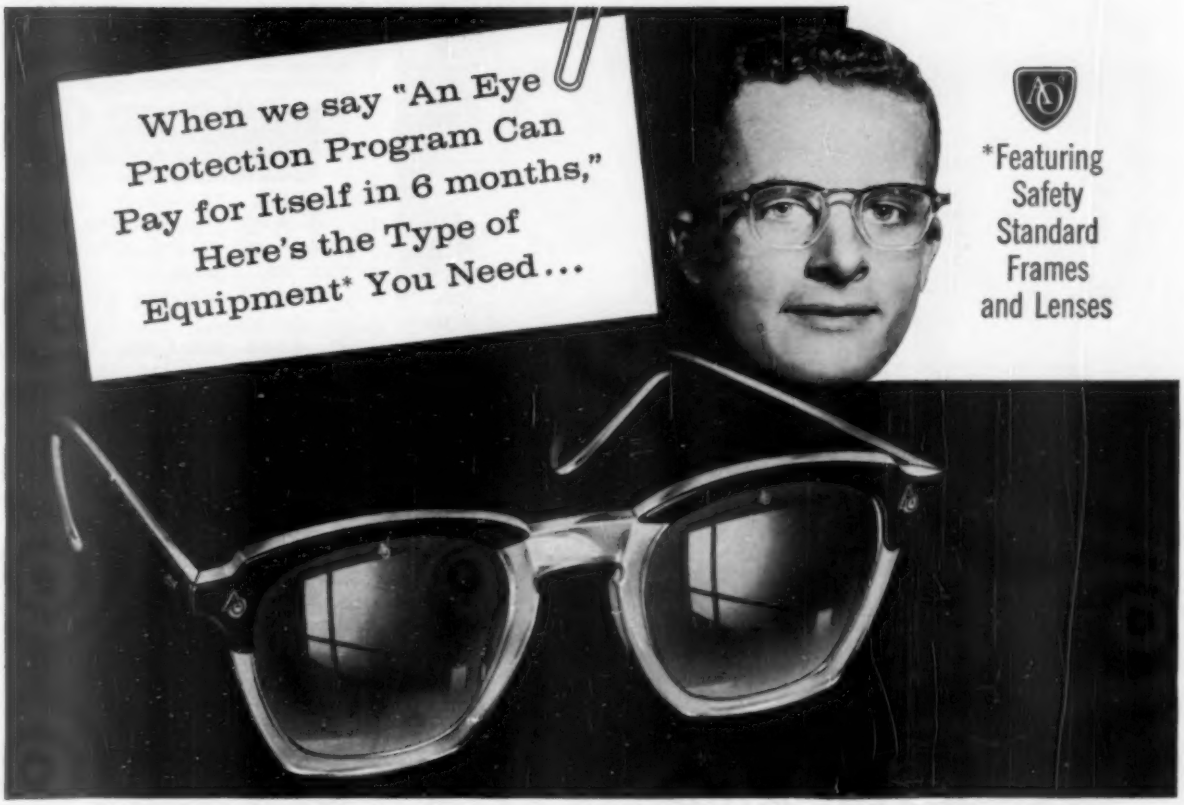
41—Power Presses. Specifications for 40 models are presented in this illustrated bulletin (1958A, 8 pages). Includes information on flywheel and back-geared inclinable presses from 16 to 150 tons. *Johnson Machine & Press Corp.*

ELECTRICAL

42—Motors. Illustrated 6-page bulletin (05-51B9040) describes "Super-Seal" open-type motors suitable for many applications that previously required enclosed designs. Available in all integral hp. frames. *Allis-Chalmers Mfg. Co.*

43—Distribution Centers. Five specific advantages of these units and suggestions for proper use are given in Bulletin GEC-1355A (28 pages). General and technical info, photos, line drawings, diagrams. *General Electric Co.*

44—Conductor Systems. This 8-pager (Form 2025A) covers crane and runway electrification for 500-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*Featuring Safety Standard Frames and Lenses

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2-TONE-ULTRASCOPIC SAFETY GLASSES WITH CALOBAR LENSES

Handsome? Surely, but most important, real *quality* protection. This particular model protects against glare, heat, ultraviolet and infrared radiations as well as against impact of flying particles. Recommended for heat treating, R.R. transportation men, bus and truck drivers and other outside workers. Also available with clear safety lenses.

Our records are full of case histories showing how companies cut costs through eye protection. Want the details? Write us direct at Southbridge, Mass., or call your nearest American Optical Safety Representative.

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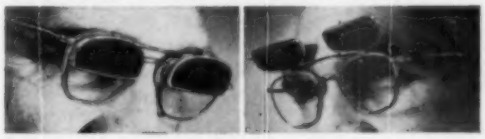
New 57.8 mm. wide vision lenses . . . double ventilation (40 mesh screen) . . . and a perfect fit over most types of spectacle glasses. *Soft* plastic mask — with leather available. Super Armorplate clear or Calobar lenses, medium, dark or extra dark. For chipping, melting, pouring, grinding etc. Also available as a dust goggle with 150 mesh screen arrangement. (Cat. #316).

NEW AO SCS-202 LIFT-FRONT ULTRASCOPIC



For open hearth furnace work and under helmet when welding. Features a half-eye metal lift-front segment, hinged to frame top. Special friction joint permits lift section to be raised and lowered repeatedly without loosening. Section is available with cobalt blue or Calobar lenses and can utilize a near point segment for welders who need corrected vision for overhead or shoulder high work.

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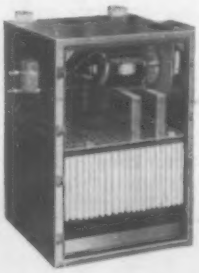
"OUT OF PRODUCTION FOR THREE DAYS? THAT'S WHEN WE'RE SUPPOSED TO SHIP!"

"And believe me, that wasn't all the boss said! Two key machines were so clogged with dirt and grime we had to disassemble and clean them—overnight! Between overtime for the repair crew and our own crew, I managed a partial shipment in three days. And I made up my mind this wasn't going to happen again!

"I'd heard of preventive maintenance with Torit Dust Control equipment—and the Torit representative I called sure opened my eyes! Clean machines hold close tolerances better and up to 80% longer! Torit collectors remove over 99% of dust and air-borne debris, save on both the cost and frequency of servicing.

"I expected there'd be a hitch on prices—but look what I found out: our production breakdown cost nearly as much as the Torit equipment we needed! And just while Torit Dust Collectors are being depreciated we'll make money on them —through maintenance savings, improved production, and reduced down-time!

"The boss actually congratulated me when I showed him the savings Torit preventive maintenance gives us!"



Torit Dust Collectors stop dust build-up before it costs you money. They're available in both high efficiency cyclone and cabinet type units. Why not check into them today—write:

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FACTORY / CATALOG NEWS

Begins on page 174

For more about these items, circle item numbers on Reader Service Card next to back cover.

1200 amp. requirements. Includes fittings and current collectors—on walls and ceilings. *The Cleveland Crane & Engineering Co.*

45—Cords and Cables. Here's a 64-page manual (No. 1108) that covers flexible cords and portable cables. Index to tabular data lists engineering info, dimensional data, splicing and terminating instructions. Photos. *The Okonite Co.*

46—Motors. This 6-pager (Bulletin 2550) describes motors designed for outdoor operation under extreme weather conditions. Ratings from 250 to 2000 hp. Drawings show insulation and ventilation features. *The Louis Allis Co.*

47—Electrical Tubing. Uses, features, and other info on metallic tubing are discussed in Bulletin RCP-900 (12 pages). Gives applications for color-coded lightweight (thinwall) raceways for protection of wiring systems. *Rome Cable Corp.*

48—Monitoring Systems. Self-contained static switching circuits are subject of Bulletin No. 1058 (6 pages). Variety of models and sizes means systems can be expanded easily. *Scam Instrument Corp.*

MECHANICAL

49—Dry Fluid Drives. Ten stock couplings and eight stock drives ranging from fractional to 1000 hp. are described in Bulletin A-640B (24 pages). Outlines operating advantages. Installation photos show applications. *Dodge Mfg. Corp.*

50—Roller Bearings. This spiral-bound illustrated 52-page catalog (No. 258) covers five standard series of self-aligning spherical roller bearings with bore sizes from 40 through 1060 mm. Technical data. *The Torrington Co.*

51—Variable Pitch Drives. Here's a 12-pager (Catalog V-183-B) that discusses drives with wide range and

For more about these items, circle item numbers on Reader Service Card next to back cover.

locking ring sheaves. Explains advantages of sliding motor base with quick release adjusting screw. Photos. *Browning Mfg. Co.*

52—Clutches, Brakes. Bulletin RSF-1 (8 pages) describes three new models of magnetic friction clutches and brakes. Data on plug-in type controls, specs, sizes and capacities. *Eaton Mfg. Co.*

53—V-Belt Drives. Many "how to" problems are covered in this 12-page manual (Catalog IP-1577). Presents case histories with photos, list of tips for V-belt maintenance, and handy inventory survey checklist. *B. F. Goodrich.*

MISCELLANEOUS

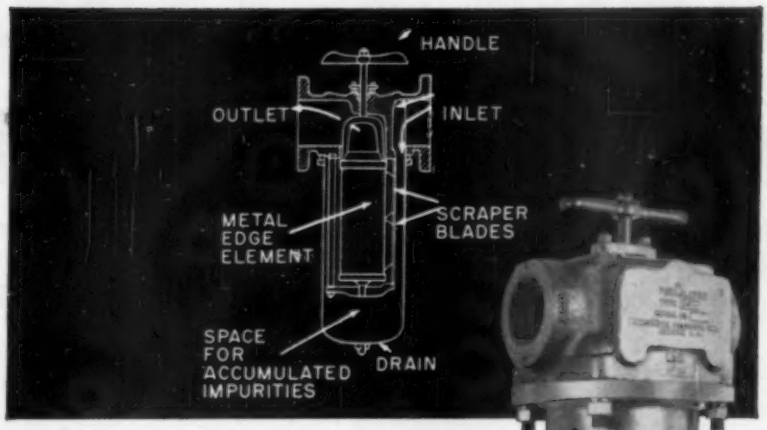
54—Calendar called "executive time planner and diary" shows major dates and travel for up to 6 months at once. FACTORY editors have been using one like it for years, find it invaluable. Your copy is free. *Barrington Associates.*

55—Fire Extinguisher. You may have the blaze out before the brave fire laddies arrive if you use this new 200-lb. pressurized dry chemical wheeled extinguisher. Bulletin P-46 (6 pages) explains design, operation. *Walter Kidde & Co.*

56—Floodlights. Catalog GEC-1486 (8 pages) covers heavy-duty, general-purpose, and general area mercury floodlighting units rated from 100 to 1000 kw. Has application info, photometric and other data. *General Electric Co.*

57—Framing, Metal. Catalog No. 810 in 180 pages (also a pocket-sized version) describes all-purpose bolted metal framing. Lists 1400 fittings and other parts; text aids identification of parts. Photos. *Unistrut Products Co.*

58—Framing, Slotted Angle. Construction handbook (Form 1051, 12 pages) and bulletin (4 pages) tell all



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EXACTLY RIGHT for all these fluids:

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- food products
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- process fluids
- fuel and lube oils

SPECIFICATIONS: This Purolator filter—model G-141J—is designed for filtration in a range upward of 40 microns.

It can be installed on pressure or suction side of pump.

It is recommended for capacities of from 6 to 200 GPM, dependent on viscosity. Spacing varies from .0010 to .020.

Relief valves set from 10-12 (generally 15 to 20) to 50 PSI are incorporated in several models.

Motor driven knife blade to clean element can be furnished whenever conditions make manual rotation impractical.

Maximum pressure: 125 PSI; Weight: 37 lbs. Equipped with simplex full-flow metal element oil strainers.

Available in all stainless steel construction for corrosive liquids, process fluids, food products.

If this filter's specifications recommend it for a problem of yours, write for catalog sheet to Dept. PF2-101.

Filtration For Every Known Fluid

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Rahway, New Jersey and Toronto, Ontario, Canada

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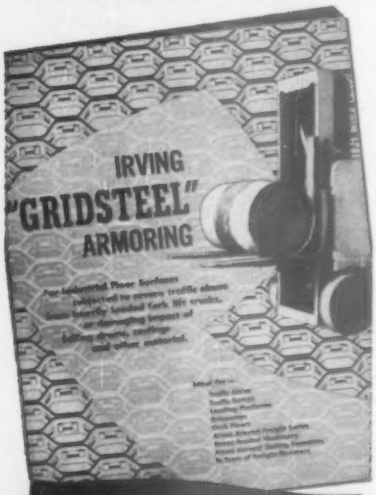

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FACTORY / CATALOG NEWS

Begins on page 174

For more about these items, circle item numbers on Reader Service Card next to back cover.

you need to know about forming slotted angle material into storage, materials handling, other structures. *Acme Steel Co.*

59—Lighting. Here are 36 loose-leaf, subject-tabbed, punched sheets arranged so you can find just the technical or pictorial information you need on various lighting products. Includes photometric data. *Silvray Lighting, Inc.*

60—Lighting, Luminous Ceiling. An 8-pager shows different luminous ceiling systems and equipment. Specs, photos, tables of coefficients of utilization and formulas. *Luminous Ceilings, Inc.*

61—Lighting, Precision. This 12-page catalog (No. 66) throws light on lamps and accessories. Includes over 50 photographs and drawings, plus dimensions and other details. *Adjustable Fixture Co.*

62—Marking Machines. Eight machines for direct-marking components, parts and packages with the U. S. manifest label legend are described in an illustrated 8-pager. Includes data on sizes, imprint areas, etc. *Markem Machine Co.*

63—Metal Cleaning Cost Analysis. Here's a 4-pager (A-7779) that discusses new method for analyzing and comparing metal cleaning costs. Booklet has standard cost factors for use in estimating hourly costs. *E. I. duPont de Nemours & Co.*

64—Packaged Plan now puts profit sharing for retirement within reach of any company regardless of size or location. Sponsored by pension consultants (Burroughs) and a Boston mutual investment fund. *Putnam Fund Distributors, Inc.*

65—Screw Thread Service. This small 24-page booklet, "SPS Screw Thread Metrology Laboratories," describes service to help solve fastener-fit problems. Photos show equipment for checking screw threads. *Standard Pressed Steel Co.*

Costly 20-gallon-per-minute water leak stopped

BEFORE

AFTER

Waterplug stops running water instantly

Here is what Underwater Services, Valley Station, Ky., had to say about Waterplug

STANDARD DRY WALL PRODUCTS CO.
Box X
New Eagle, Penna.
Gentlemen:
On October 6, 1957, our Underwater Services Company was called upon to repair a major break in an underwater drainage system for the Hardin County Sportsmen's Lake at Elizabethtown, Kentucky. Upon diving to the bottom of the lake we discovered several large ruptures in the 24" tiles used in the drainage system. Water, uncontrolled, was pouring through these breaks at a minimum approximate rate of 20 gallons per minute. Using underwater diving equipment we managed to reduce this torrent by packing sandbags into the holes channeled through the four feet of earth covering these tiles. Descending through a water control tower, we gained access to the interior of the drainage tiles to the area of breakthrough. Above us were four feet of lake bottom and 28 feet of water above that. Under these extremely adverse conditions we used the Thoro System WATERPLUG Cement to repair the breaks from the interior of the tiles.
Because of the simplicity and ease of mixing and applying WATERPLUG Cement, we were able to completely and effectively repair these breaks in the drainage system.
We were delighted with the effectiveness of WATERPLUG Cement in successfully overcoming this difficult water problem. Feel confident that in future underwater repair problems, our company will rely upon WATERPLUG Cement.
Very truly yours,
MICHAEL CALE,
Manager.

WRITE FOR BROCHURE
"HOW TO DO IT"

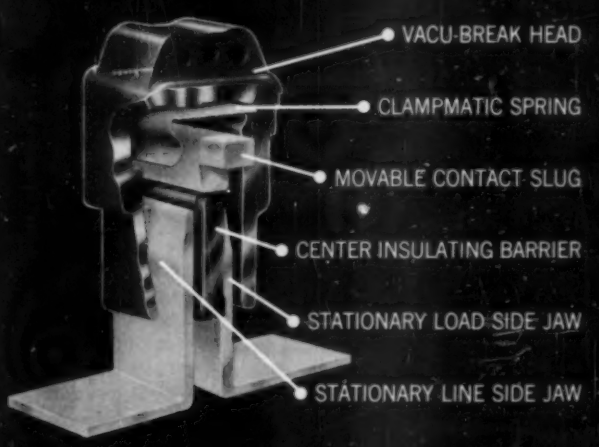
STANDARD DRY WALL PRODUCTS, INC.
NEW EAGLE, PA. • CENTERVILLE, IND.

FOR SAFETY'S SAKE BUY VACU-BREAK

There's a big difference in safety switches—a difference between maximum safety and halfway safety—low maintenance and excessive maintenance. These differences are readily apparent when you look at the design and operation of the BullDog Vacu-Break Clampmatic* Safety Switch.

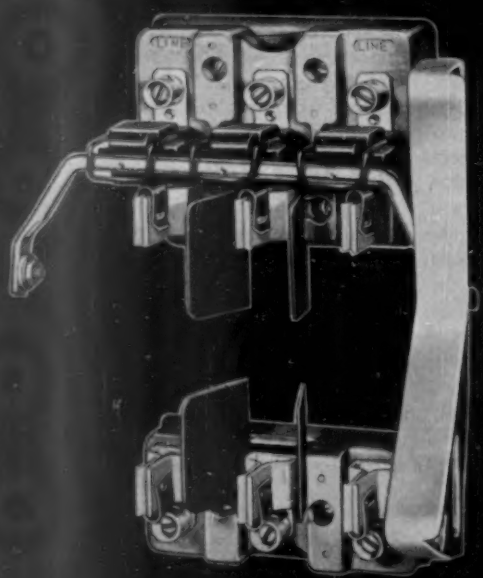
THE VACU-BREAK: Contacts are housed inside compact arc chambers which have very little air space. When contacts are "broken" under load, arcs can't build up because of the lack of oxygen. Pitting and burning of the contacts are reduced to the absolute minimum. Maintenance is virtually eliminated.

POSITIVE SWITCHING: For positive safety, the Vacu-Break switching mechanism does not rely on tricky toggles or springs to trigger the disconnect operation. The operating handle is directly connected to the contact heads by means of a sturdy *metal* rod. Push the handle "OFF" and the switch *is off!*



Vacu-Break heads are connected directly to the switch handle. No toggles or triggers . . . no tricky springs. No danger of switching failure, either. One of several exclusive BullDog Vacu-Break features that set the performance standards for the industry.

Close-up of Vacu-Break head shows movable contact slug inside the compact, oxygen-limiting arc chamber. Clampmatic spring assembly assures bolt-tight contact, speeds "break". This combination guarantees positive, safe operation, long switch life.



WITHSTAND 100,000 AMP FAULT CURRENT: Vacu-Break Clampmatic switches equipped with current-limiting type Amp-Traps** were subjected to 100,000 amp short circuit current. *The switches were undamaged.*

Play it safe! Compare, recommend, *buy* . . . BullDog Vacu-Break Clampmatic Safety Switches. They cost no more than other switches . . . yet give you the maximum in safety and performance. © BEPCO

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***Amp-Trap is a registered trademark of the Chase-Shawmut Company.*

BULLDOG

BullDog Electric Products Company, Division of I-T-E Circuit Breaker Company, Detroit 32, Michigan. *BullDog Export Division:* 13 East 40th Street, New York 16, New York. *In Canada:* BullDog Electric Products Co. (Canada) Ltd., 80 Clayson Rd., Toronto 15, Ont.

For more facts Circle 557 on Reader Service Card

Coming (and soon, we hope):

An End to Your Motor-Buying

Baffled by motor standards that lag behind new developments? Here are hints on how to be smart about buying motors—and warnings of hazards ahead.

BUYING A MOTOR by horsepower alone can trap you in some of the same pitfalls as buying a car the same way. In either deal you'll have to be alert to get the most usable power at the most economical cost. Why? Because it isn't easy to find just the right balance between ample capacity and lowest motor cost. And because standards and nameplate ratings in use today don't cover all the significant new developments in motors. The result: puzzlement for today's motor buyer.

Here's what it boils down to: You can—right now—accept higher-temperature insulation and get by with a smaller, less expensive motor. But without new standards to guide you, you'll have to know your stuff to make the right choice. Your best hope for the future: New standards that will take new motor developments into account. Your biggest hazard: a period of anarchy while new standards take shape.

The picture is complicated mostly by fast-breaking advances in motor-insulating systems. Specifically, major advances in the technology of silicones and plastics. All these advances represent improvements over the older organic types of insulation. Some of them hold so much promise that it's likely they'll be changing the design, purchase, and application of motors in the not-too-distant future

But before you can make sense out of the changes that are likely to take place, you should understand the relationships among class of insulation, operating temperatures, horsepower, and torque. They all bear on your selection.

By V. J. EGAN
Motor & Generator Department
Allis-Chalmers Manufacturing Company
Milwaukee

WISING UP ON HORSEPOWER

The full-load horsepower rating of any motor is limited by its maximum temperature determined largely by the insulation's safe temperature ceiling. With insulations that withstand higher operating temperatures, a given motor design can produce more horsepower continuously.

But the full-load horsepower capability of a given motor design is determined by the maximum torque it can develop at rated speed. Because horsepower equals torque times speed, the horsepower (or torque) capability of a motor is limited only by the maximum current that can flow through the windings. This available energy is always many times the nameplate horsepower rating. Thus if you had insulations that were completely unaffected by temperature, motors could be reduced to a fraction of their present size.

The factor that rates the output of a motor (once you overlook operating temperature) is maximum torque capability. If you look at the load, the only thing that counts is torque — assuming you have the proper speed. The motor must have enough starting torque to break the static friction when the load is stalled (and not too much to shear couplings or cause other damage). It must have enough torque during acceleration to bring the load up to speed within a specified time—and enough available torque to take any predictable overload without stalling.

The horsepower supplied to a typical load varies over a wide range and, except at normal load, may have little relationship to the nameplate rating of the motor. Yet you'll find horsepower rating is used everywhere in industry (except for some special-purpose motors) to describe what's expected of a motor.

Why were motors rated by horsepower in the first place? A few reasons are obvious. Early motors replaced steam drives, which had been rated in horsepower. And the first early motors were generally applied to machines that did not require excessive amounts of torque when starting. The designer's main job was to build a motor to handle rated load. What's more, until the development of strain gages in recent years, there was no convenient, accurate method of determining torque.

So what happened? When the first steps toward standardizing motors were taken over 50 years ago, the question whether motors should be rated in torque or horsepower had already been decided.

FIGURING TORQUE

The question of minimum torque guarantees is handled in two different ways by today's standards. For general-purpose ratings of squirrel-cage induction motors up to about 200 horsepower, NEMA standards specify minimum starting (locked-rotor), accelerating (pull-up), and overload (pull-out) torques in terms of percentage of full-load torque. (Full-load torque is automatically

Puzzles

determined by a motor's horsepower rating.) These ratios were set up on the basis of good-sense compromises that took into consideration design problems, average installation conditions, and typical driven machine loads.

To match a wide variety of applications and loads, general-purpose motors are offered in five different classes of motor designs (labeled A, B, C, D, E) with various dynamic torque characteristics. In larger sizes, however, the only torque capability of a motor standardized among manufacturers has been full-load torque, which is determined by nameplate horsepower rating.

The torque rating of any motor is the torque it can develop without exceeding a safe temperature rise. Safe temperature rise is determined by the type of insulation used. That brings you back to insulation.

EVALUATING INSULATIONS

Class A insulated motors (cotton, paper, silk, organic varnish insulators) are limited to 105 C. at the hottest spot. Class B insulations (mica, glass, asbestos, silicones with a Class A binder or varnish) have an allowable hottest spot temperature of 130 C. The most stable insulation, Class H (glass, silicones, mica, etc.), with a completely inorganic binder, is presently rated for a hottest spot temperature of 180 C. These three limits correspond to the more frequently used temperature-rise ratings of 40 C., 60 C., and 100 C.

But here's what's happened. In all three classes of insulation, new materials have come along—plastics like mylar, polyethylene, and epoxy resins; combinations of new and old materials like mica and polyester resins; asbestos and silicone varnishes; and all-silicone rubber. But these new materials (some of which are really entirely new insulating systems) must, under existing ASA standards, be classed in either the A, B, or H group, despite their ability to retain their insulating qualities for many years at temperatures beyond present limits.

As an example of the incongruity this presents to designers, take Class H, in which the most dramatic changes have come about. A Class H all-silicone-rubber-insulated open motor operating at a maximum of 85 C. rise will show almost no deterioration of insulation strength after many years at full load. Good engineering calls for equipment to be designed to last for a reasonable lifetime, and over a period of many years some drop-off in insulation strength would be considered normal. The designer is left with two options to bring Class H insulation design in line with the same "reasonable life" criteria used for the rest of the motor. He can reduce the thickness of the insulation (to work the dielectric quality of each silicone molecule a little harder) or reduce the winding size and run the motor hotter (probably making it smaller at the same time).

Both of these paths are closed to him by today's standards. Winding size cannot be reduced much without raising operating temperature beyond today's accepted practices. And reducing insulation dimensions below a certain minimum level becomes unsafe—from a simple mechanical viewpoint, at least.

This, of course, does not affect the designer of special motors. Nonstandard designs, where very high-temperature operation is acceptable, are the motors that pack high torque capabilities into units a fraction the size of standard motors. Both industrial and military experience with Class H insulations at extreme temperatures has been very satisfactory.

Result is that standard motors with the new insulations have built-in heat-withstanding characteristics that earlier motors did not have, even though manufacturers' performance guarantees remain unchanged.

Turn the page

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MOTOR-BUYING PUZZLES

Begins on page 182

As the new insulations can withstand temperature rises far beyond the motor's corresponding torque capability, horsepower ratings based on full-load temperature rise now lose their significance. Today's motors can be selected to match actual starting, accelerating, full-load, and over-load torque requirements of the load. In other words, they can be designed to produce enough torque with little concern for winding temperatures.

(Benefits of the new insulating systems apply only to insulated windings. In the squirrel-cage motor, the rotor conductors have no insulation. For some high-inertia loads, where rotor thermal capacity determines the minimum motor dimensions, no important size reductions can be expected.)

PICKING A MOTOR

How do you choose a motor on the basis of peak torque requirements? Here are a few examples:

High pull-out torque—These are the loads like Banbury mixers in rubber and plastics plants or Hydrapulpers in paper mills, where peak overload demands rather than the assumed average value of motor load determine motor construction. This kind of motor will probably be smaller than designs under existing standards because the reserve capacity to prevent short-time high temperatures is unnecessary. Most loads in this category require only normal starting torques. Where starting load is excessive, it might be more economical to use a clutch or other method of unloading and handle the drive with a much cheaper motor.

High break-away and accelerating torque—Motors driving loads like ball or hammer mills call for capability to withstand great short-time heating during the instant of starting. For most of these drives full-speed or overload torque requirements are no problem. Nor are stator insulation temperatures. Rotor capacity would be the limiting factor.

Normal starting torque, fixed load—When the driven load is a centrifugal pump, fan, or blower, still another condition exists. All torque

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BY THE THOUSANDS

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LSA Standard Duty

LSAO Heavy Duty

Protection, economy, design-appeal featured in new LSA and LSAO standard and heavy duty units

Introduction of Fafnir LSA and LSAO pillow blocks opens new opportunities for improving both machine performance and styling, and reducing costs in standard and heavy duty applications.

Equipped with integral seal, wide inner ring ball bearings, the units are positively protected against contaminants and loss of lubricant. Fafnir-originated self-locking collars permit fast, easy, cost-cutting installation. Moreover, though the new series are made to the same base-to-center height dimensions and bolt-hole spacings as corresponding sizes in Fafnir's SA and SAO series, they are available at lower initial cost.

Housings are solidly built and of massive, streamlined design to harmonize with modern machine styling. All units are prelubricated and have provision for relubrication, if necessary . . . come ready to mount . . . and are designed to take radial, thrust, or combined loads in any position. Write for new bulletin showing sizes, dimensions, types, features. The Fafnir Bearing Company, New Britain, Connecticut.

FEATURES

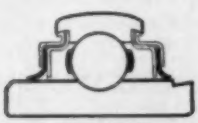
Positive Protection — Slinger-type Mechani-Seals for protection at higher speeds; contact-type Plya-Seals for slow-to-moderate speeds, dirty or wet conditions.

Extra-Sturdy Support — Wide Inner Ring Ball Bearings with deep grooves and large balls for sturdy shaft support.

Simplest Installation — Fafnir-originated eccentric cam self-locking collar provides positive locking to shaft with twist of wrist. No machining, no mounting devices.

Self-Alignment — Spherical bearing O.D. and corresponding spherical housing seat assure self-alignment in any direction.

Modern Styling — Smoothly finished, streamlined, massive cast iron housing with machined bearing seat and base.



Plya-Seal

Integral Seal Ball Bearings

Mechani-Seal

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Bearings in LSA units are Mechani-Seal type — or available optionally with Plya-Seals (RSA). LSAO series bearings are Mechani-Seal type, except those for shaft sizes $3\frac{3}{16}$", $3\frac{7}{16}$", and $3\frac{15}{16}$", which have Plya-Seals (RSAO).

For more facts Circle 560 on Reader Service Card

NEWS

ABOUT MACHINE MOUNTS

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MOTOR-BUYING PUZZLES

Begins on page 182

requirements are normal and full speed is quickly attained. Here torque requirements are easily matched. The minimum efficiency and power factor that a user will accept will determine the motor's rating and its physical size.

WEIGHING TORQUE HAZARDS

Buying torque instead of horsepower has its pitfalls. Most of them are the same as those encountered with present standards. But built-in reserve makes the dangers less obvious. A motor designed strictly on torque requirement may lack spare capacity for abnormal operating conditions. Extreme temperatures, improper lubrication, and low operating voltage (especially if they occur simultaneously) all reduce available torque. If they occur at the critical point in starting or operation, the motor may stall.

Excessively high operating temperatures under abnormal conditions can raise bearing temperatures to a point where lubrication could break down, because there might not be as much margin of safety as under present winding-temperature to bearing-temperature differentials.

Electrical characteristics change when operating temperatures rise. Full-load efficiency may drop off several percentage points, while the half-load point will approximate existing high efficiencies. Power factor is similarly affected.

Another and more serious problem could result if ambient conditions or abnormal operating practices should cause heating beyond acceptable limits. Jogging a motor, for instance, as occasionally occurs during driven machine set-up or adjustment, heats the rotor squirrel-cage rapidly. Unless the motor is allowed to return to normal operating temperature, distortion or damage may result. Blocked ventilation passages or too many closely spaced starts have the same effect.

CHANGING STANDARDS

The big question in motor application practice is whether changes will or should be made in motor standards to accommodate the in-

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PROCESS CONTROL. Automatic temperature and humidity control for a wide range of manufacturing and industrial process applications. Thermostats, special controllers, valves and dampers applied to tanks, dryers, vats, kettles, curing rooms, coolers, kilns, ovens and other processing equipment.

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V-103 N.O. Globe Valve. ½" to 8" sizes. *Send for Bulletin V-103.*

3-Way Valves for mixing and by-pass applications. 100% tight-closing design. Can be serviced without removal from line. Sizes 2½" to 6". 125 and 250 lb. standard construction. *Send for Bulletins V-211 (By-Pass) and V-214 (Mixing).*

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T-901 Remote Bulb Submaster Thermostat. *Send for Bulletin T-901.*

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T-403 Single Temperature Room Thermostat. *Send for Bulletin T-403.*

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creased capability of newer insulations. Almost without exception the newer insulations in all three classes provide a higher margin of overload safety than their predecessors. (This is one of the reasons that some NEMA frame size standards were reduced a few years ago.)

The need for change has been recognized in one respect. AIEE insulation committees are developing test codes on which to base the classification of insulating systems according to temperature limits rather than chemical composition. This will force a change in motor standards—but how much? In the integral horsepower ratings (below 200) problems of mechanical clearances and bearing temperatures limit winding temperatures more than insulation capabilities do. So opportunities for getting more out of a given motor frame size will be less in the smaller sizes and ratings.

The greatest margin for savings, of course, lies in the Class H types of insulation. Why? Because evidence is pretty conclusive that silicones will withstand temperatures far beyond what was originally thought to be safe. Some applications of silicone insulating systems have operated for years at temperatures of 200 C. with no signs of aging. Costs of motor construction are such that a typical 60 C. rise, all-silicone-rubber-insulated motor with drip-proof enclosure can be purchased today for about the same price as a comparable Class A 40 C. rise motor. The Class H motor takes less space, weighs less, and has less starting inertia and greater overload carrying ability. In fact, in many applications (if motors were selected on actual torque requirements) even this 60 C. Class H motor is larger than necessary.

Some users have convinced themselves through tests and experience that present large Class H motors can be overloaded safely well beyond the manufacturers' ratings. Such a practice is risky. It places the responsibility solely on the user. Yet it is becoming more and more common. If nothing else, this situation points to the need for a reexamination of today's standards.

A change in motor standards poses almost as many problems as it solves. Even the last NEMA frame-size re-rating program, a relatively simple change, met quite a bit of opposition. Enthusiasm for a change is certainly not universal.

Standardization of electric motors has often been cited as one of the best examples of the type of standards that benefit everyone—user and manufacturer alike. Big worry is that motor standards, established for some 50 years on a framework basis, could collapse in complete anarchy. Only the technically trained purchaser could work his way through the maze of speed-torque curves that could become the basis for motor prices. And no one wants this to happen. **END**

Quick case history—reading time 42 seconds

How 2560 tons of cooling equipment resist corrosion with Hagan CS

THE PLANT: 42-story office building at 525 William Penn Place, Pittsburgh. Hot-chilled water circulating systems contain steel risers, copper runouts, brass automatic valves; air condition 13,500,000 cubic feet of office space; circulate 14,000 gallons of water.

THE PROBLEM: Find a corrosion-inhibiting chemical to protect these 2560 tons of refrigeration machinery. Chemical must be effective for both ferrous and non-ferrous metals, easy to handle, easy to feed, non-injurious to packing or pump seals, non-staining to painted surfaces should closed loops leak.

THE SOLUTION: Hagan Corrosion Inhibitor CS meets all specifications; is added through conveniently located pressure pot feeders. Simple colorimetric control test tells when to add to compensate for minor leakage through glands and packings. The hot and chilled water systems treated with CS have required practically no maintenance.

TEST RESULTS: Standard 1 x 2 inch pre-weighed corrosion test specimens installed at critical locations throughout system showed these typically low corrosion rates (mg/dm²/day) after introduction of CS Inhibitor:

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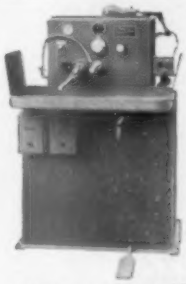

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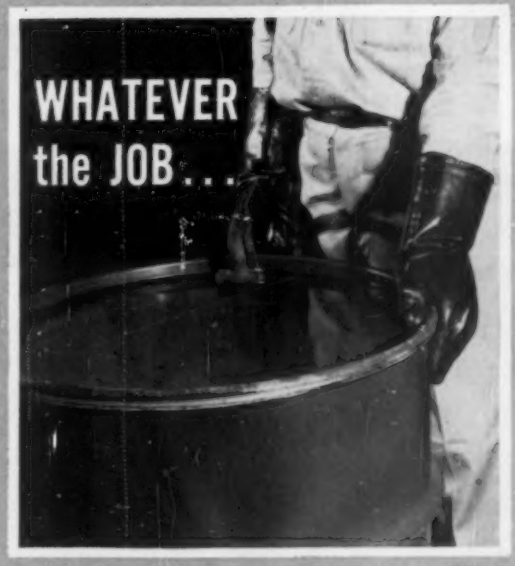

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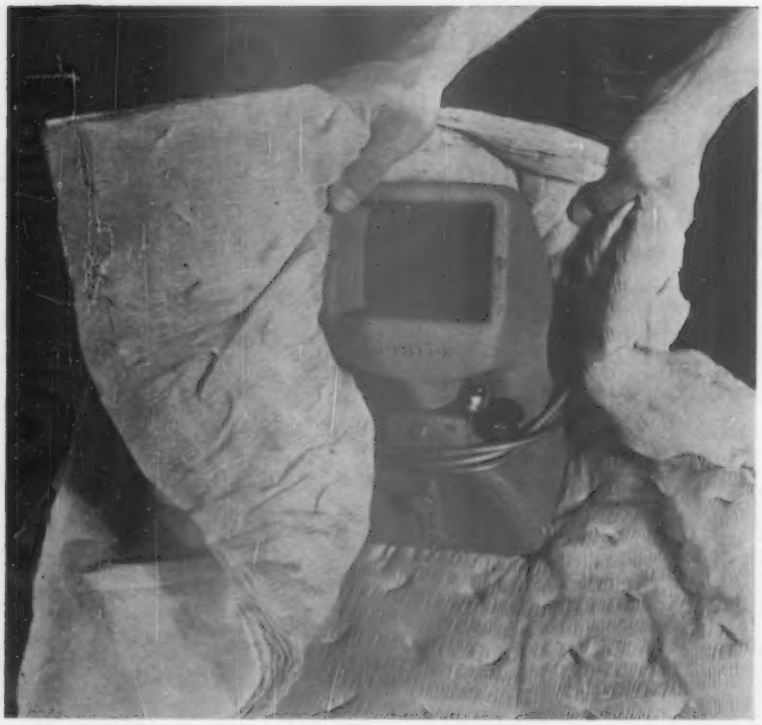
MATERIALS NEWS

For more about these items, circle numbers on Reader Service Card next to back cover.



New Material for Safe Packaging

The wraps are off this new low-cost creped wadding cushioning material for packaging.

Developed after four years of research, the new material known as Super Crepe Kimpak has the following characteristics: Conformability, resilience, non-abrasiveness, uniformity, high absorbency. It is odorless, dust-free, soft, and non-corrosive. The material is available in thicknesses ranging from 0.04 to 0.50-in., bleached, unbleached, or in combination. Comes in various sizes, roll or sheet form, with complete selection of backing paper.

This cushioning "wrapper" is especially suited to blocking and bracing, flotation, absorbent packing, and surface protection packaging. Glassware, automotive parts, and delicate instruments travel safely wrapped in the soft material. *Kimberly-Clark Corp.* (Circle 251)

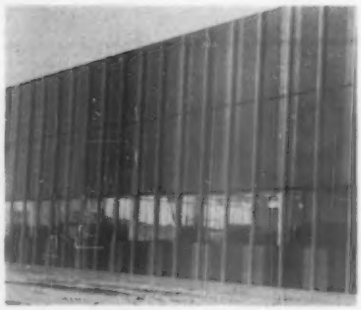
Easy-to-Lay Flooring

Here are floor panels that can be laid quickly without special tools or skill. Ready-to-lay Poly-Rock is for use over wood and concrete surfaces. No adhesives are needed for anchoring panels—screw nails or drive plugs fasten them. Size: 4x8 ft., ⅜ in. thick. *Plant Maintenance, Inc.* (Circle 252)

253—Plastic Coatings for temporary protection of highly finished surfaces that might be damaged during handling. Come in two classes: fast-drying solvent solutions and plastic water dispersions. Easy to remove. *Guard Coatings Corp.*

254—Pipes and Fittings of impervious graphite material are unaffected by most corrosives except a few highly oxidizing agents. Easily fitted with a hacksaw and wrench. Piping comes with flanges attached. *Falls Industries, Inc.*

255—Cold Drawn Steel Bars are now produced to a new high standard of brightness. Known as Bright-Drawn, the bars are widely used for manufacture of precision parts by machining. Come in various shapes. *Jones & Laughlin Steel Corp.*



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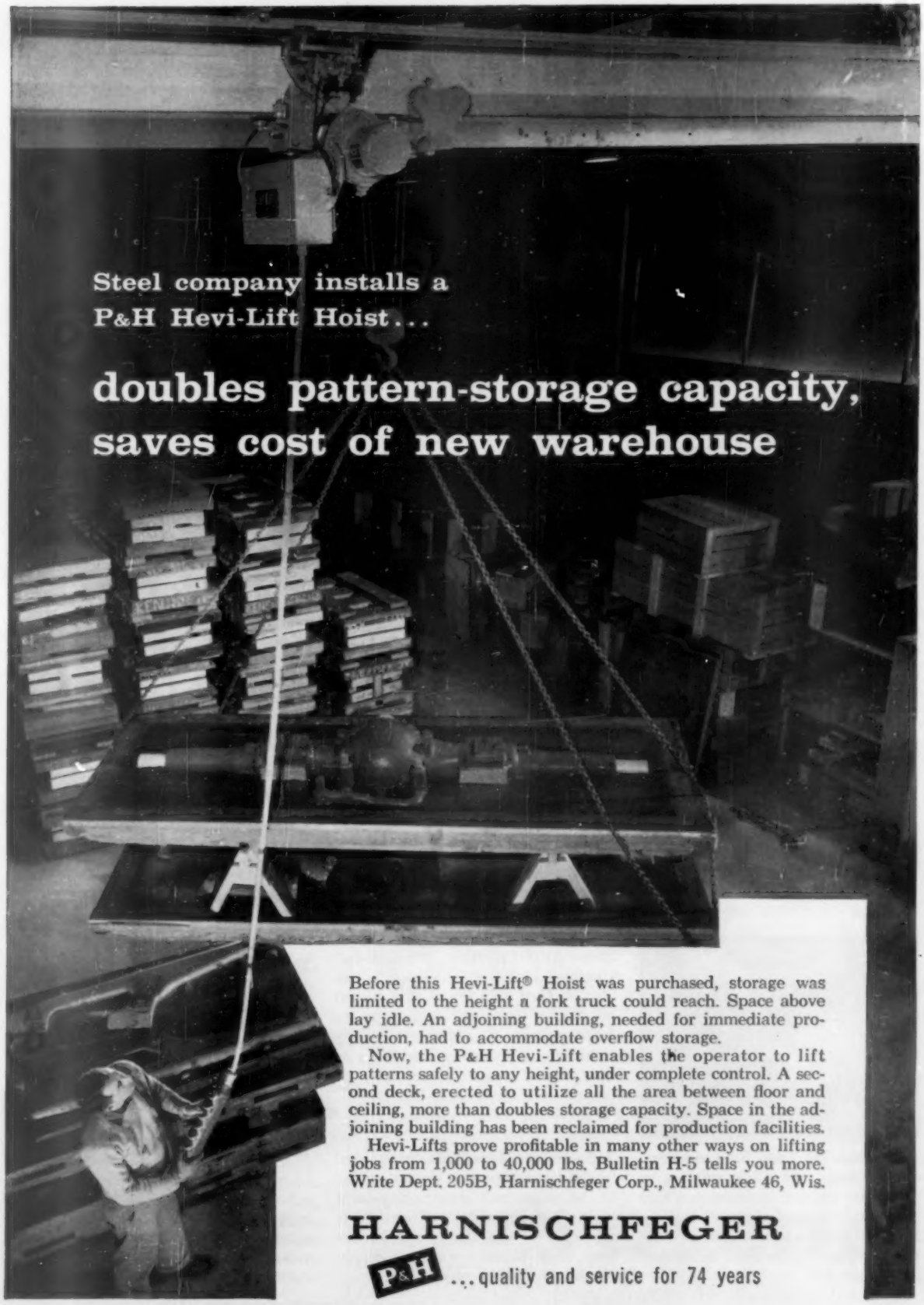
Less than half an inch thick. Panels for this remarkable curtain wall are made up of a cement-asbestos core sandwiched between porcelain-coated aluminum sheets. (Or interior surface may be laminated with a vinyl sheet for decorative effect.) Yet when mounted in special neoprene synthetic rubber gasket (for super-fast erection) panels will withstand hurricane winds or Minnesota winters—where they've just been used in the new IBM building. *Hamlin-Stevens, Inc.* (Circle 256)

Turn the page



Steel company installs a
P&H Hevi-Lift Hoist...

doubles pattern-storage capacity, saves cost of new warehouse

Before this Hevi-Lift® Hoist was purchased, storage was limited to the height a fork truck could reach. Space above lay idle. An adjoining building, needed for immediate production, had to accommodate overflow storage.

Now, the P&H Hevi-Lift enables the operator to lift patterns safely to any height, under complete control. A second deck, erected to utilize all the area between floor and ceiling, more than doubles storage capacity. Space in the adjoining building has been reclaimed for production facilities.

Hevi-Lifts prove profitable in many other ways on lifting jobs from 1,000 to 40,000 lbs. Bulletin H-5 tells you more. Write Dept. 205B, Harnischfeger Corp., Milwaukee 46, Wis.

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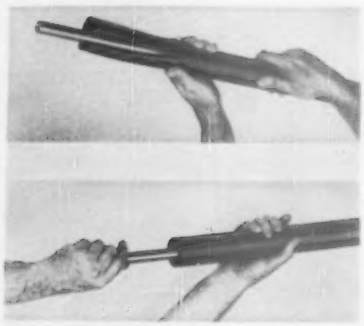


257—Pipe Insulation of closed-cell construction excludes water, moisture, air; is unaffected by oil, acid, alkalis. "Packaged" in 6-ft. lengths; ½-in. wall thickness for pipes ⅜ to 2½ in. *Presstite-Keystone Engineering Products Co.*

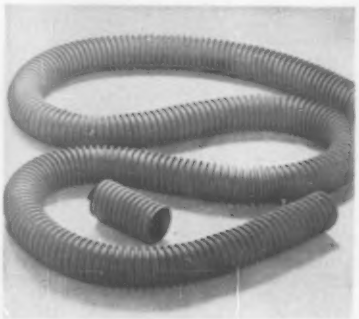
258—Polyethylene Film, now reinforced with Fiberglas, provides greater strengths with thinner materials, and eliminates stretching, bagging, billowing. Applications: weather, moisture, and dust barriers. *Owens-Corning Fiberglas Corp.*

259—Rubber Pipe Sections that are flexible and light in weight absorb vibrations, deaden noise when used as connections on metal pipes for pumps, compressors, engines, processing, heating, and other equipment. *Vibration Mountings, Inc.*

260—Banding Tape for armatures, transformers, and other rotating or stationary electric machinery where bands can be applied under tension. Scotchply is made of unilateral nonwoven glass filaments. *Insulation and Wires Inc.*

261—Pliable Electrical Conduit that provides protection for cables can be set and bent on corners and curves—eliminates need for bends and elbows. Stays rigid after bending; can be shaped without distortion of bore. *Gemmer Mfg. Co.*

262—Super Adhesives that form lasting bonds are said to be radically different—they "can't resist a strange molecular impulse to bond nearly any surface to itself or to another." Colorless or in colors. *B. F. Goodrich Industrial Products.*



263—Neoprene Hose, with high durability for long service, can be used as flexible duct for exhausting fumes, vapors, dust, mists; for low-pressure conveying of powdered materials, etc. In continuous, seamless lengths. *Burton Mfg. Co.*

264—Anti-Friction "Break-in" Coating, a phosphate material, can also be used as a foundation for oil or paint. Provides coating up to 3000 mg. sq. ft. on iron, steel, or cadmium. Applied by immersion or tumbling. *Turco Products, Inc.*

265—Solder Terminals, designated "Leed-savrs," permit circuit wiring to be separated from component wiring with a minimum of heat. Parts spoilage is minimized; changeover time said to be reduced. *Alpine Electronic Components Corp.*

266—Disposable Inserts come in various grades of Carboloy and in 10 new sizes. Blanks available for standard or special uses. Each insert is etched with the grade, size, and type, numbered to industry standards. *General Electric Co.*

MATERIALS LITERATURE

267—Coatings. Clear and colored coatings for use on metal, plastic, glass and wood are discussed in 36-page booklet. Has info about spraying, screening, and roller coating; also data on standard colors, metallics. *Bee Chemical Co.*

268—Lubricants. Here's a fold-out booklet (8 pages) that tells all about general and specialty lubricants, greases, cutting, quenching, and other metalworking oils, solvents, rubber process aids. Lists over 400 products. *Sun Oil Co.*

269—Snow Melting Fluid. Instead of digging out of the snow, use a heat transfer fluid that melts it. Here's a 20-pager that describes an aqueous ethylene glycol solution that can also be used as a secondary coolant. *Dow Chemical Co.*

270—Colored Steel. Not *all* colors of a rainbow are available in this building steel, but those it does come in are shown in a 4-pager (Form 581-223). Color coating is two layers of vinyl-aluminum applied to steel. *Stran-Steel Corp.*

271—Small Tubing. This 12-pager (No. 41) is a "Selection and Application Guide" for small-diameter tubing. Materials grouped as carbon, alloy and stainless steels, nickel and nickel alloys, copper-base alloys, etc. *Superior Tube Co.*

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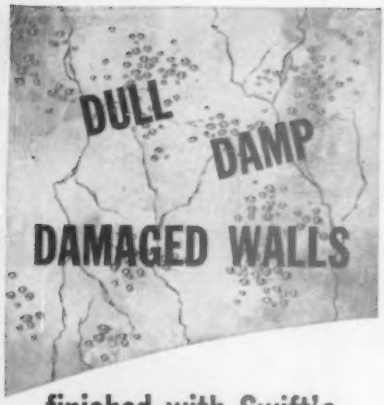

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FACTORY
MANAGEMENT AND MAINTENANCE

BOOKS

By CARROLL W. BOYCE, Manager, Features and Departments, FACTORY

Linear Programming for Managers

In the spate of literature about linear programming, the new book by Bob Ferguson and Larry Sargent stands out like a beacon light on a barren shore. Here, for the first time, is a book aimed directly at a management audience. Yet the authors have come up with something far more than an "appreciation" of LP and its potentials.

Reading *Linear Programming* won't make you a hot-shot LP expert; many of the highly sophisticated aspects of LP are glossed over, and some of the "advanced" techniques—like dynamic programming—are not even mentioned. But this book will give you everything you need—as a manager and even as a slightly-less-than-expert practitioner—to grapple successfully with most practical industrial applications of LP. And you don't have to be able to think in mathematical symbology to achieve these happy ends.

The authors have accomplished this tour de force—it's nothing less—by building their entire book on a series of simple but realistic case examples. Then they have used the actual numbers in the examples to show how and why the matrixes are built, and how the process of iteration of the matrix determinants leads to optimum solutions. (That last sentence is at a higher level of abstraction than any you'll find in the book—except for the appendix, where the mathematical derivations are given for those interested.)

The result of this realistic approach is that the authors establish a fine rapport with the practical-minded industrial plant manager. You are led by the hand (mathematically speaking), but you are never patronized. It's a neat trick, and done to perfection.

Three of the chapters will be of particular interest. They present short-cut methods which the authors identify by the names Modi, ratio-analysis, and index. While all three have been tested by the authors and their colleagues of the H. B. Maynard Company on Consulting assignments, little has been written about them. In part, this may be due to the fact that they are all "limited situation" methods—and they can't do anything that can't also be done by the more laborious and more complicated simplex method. Could be that some of the LP experts (especially those afflicted with ivory-toweritis or computeritis) will take some pot shots at these short cuts.

We can't pass professional judgment on a point like this. But all these methods—and particularly ratio-analysis—look so beautifully simple that we feel they deserve immediate study by anyone interested in introducing LP without a computer or a brain trust—or in simplifying many present LP procedures. In short, this book is a corker. Don't miss it.

Linear Programming, by R. O. Ferguson and L. F. Sargent. McGraw-Hill Book Co., 330 West 42nd St., New York 36. 356 pages. $10.

Another Entry on Linear Programming

This month's second entry in the LP sweepstakes bears the same title (*Linear Programming*) as the Ferguson and Sargent book. (It's even the same publisher!) But this opus by Saul Gass is cut from a different piece of cloth. It's a fine job, but strictly for the active or would-be practitioner.

Written as a textbook, the level of abstraction is high. Unless you can think in mathematical symbols (even in the "case examples"), you'll find this one hard going. While such simplifications as the Modi and ratio-analysis methods are not even mentioned, Gass provides an excellent treatment of many of the more sophisticated elements of LP. For example, the concluding chapter on the relationship of LP and the theory of games is both stimulating and revealing (even if tough reading).

Warning: Don't get trapped into buying this book simply as "the less expensive" of two good books on

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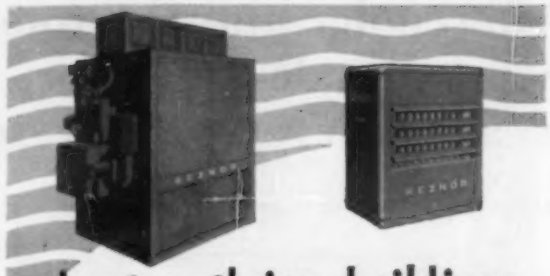

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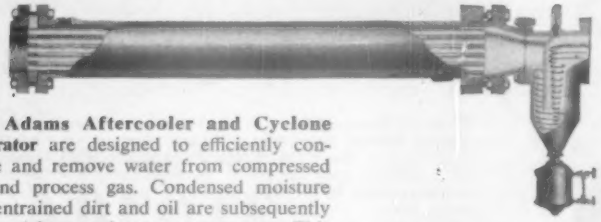

The Adams Aftercooler and Cyclone Separator are designed to efficiently condense and remove water from compressed air and process gas. Condensed moisture and entrained dirt and oil are subsequently removed in a cyclone type separator. This unit is scientifically designed for maximum removal efficiency over a wide range of flow rates.

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Begins on page 194

LP. The two are aimed at different audiences. Unless you want both (as we suspect practitioners and serious students will), be sure to specify carefully when ordering.

Linear Programming, by Saul I. Gass. McGraw-Hill Book Co., 330 West 42nd St., New York 36. 234 pages. $6.50.

Soft Sell Safety

Intelligence and good judgment permeate *Modern Safety Practices.* From title page to index, the author keeps his safety fervor in check, builds his case on logic. Not that motivation of the reader isn't an aim —it is. But the hard-sell emotional pitch is refreshingly absent.

The author is a good communicator. He writes in an easy, readable style. And he's not one to pussyfoot around controversial issues. Some examples: (1) He forthrightly argues that safety is a management responsibility, should not be palmed off on employee committees. (2) He presents convincing arguments to combat the "accident prone" notion that's currently salving many a manager's conscience.

Central theme of the book is that the line supervisor is the key guy in the safety operation. The theme is old, but most beaters of this drum build their cases in one chapter, ignore the line manager in every other chapter. Not so here.

(Reviewed by George A. Hoy)

Modern Safety Practices, by Russell DeReamer. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16. 357 pages. $7.

New Fire Codes

A revised edition of the National Fire Codes is available. The six volumes are: 1) Flammable Liquids and Gases; 2) Combustible Solids, Dusts, Chemicals, and Explosives; 3) Building Construction and Equipment; 4) Extinguishing Equipment; 5) Electrical; and 6) Transportation and Miscellaneous.

National Fire Protection Assn., 60 Batterymarch St., Boston 10. 4800 pages. $7 per volume.

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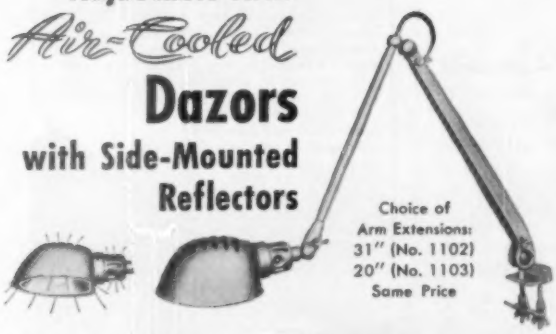

Choice of Arm Extensions: 31" (No. 1102) 20" (No. 1103) Same Price

Now it's as easy to beam light into a recess, or around an offset, as onto a simple tool or bench position. This Adjustable-Arm Dazor with side-mounted reflector offers same low-cost air-cooled efficiency and positive tension control as top-mounted style. Uses 60-w bulb. Call your Dazor distributor. Dazor Manufacturing Corp. St. Louis 10, Missouri.

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fireproof vents
with
eye-appeal!
Architects & Engineers: Walter Wagner & Partners, Fresno, Calif. Mechanical Contractor: Robert Wright Plumbing, Porterville, Calif.

New plant at Porterville, Calif., has twenty-two 8" Transite exhaust flues.

Vertical exposed flues of Transite Vent Pipe form eye-catching design on new Rockwell Manufacturing Co. installation

A glance at this attractive new plant tells you that the material used for the exhaust flues is vital to the plant's appearance and maintenance economy. That's why Walter Wagner & Partners, Architects & Engineers, of Fresno, Calif., chose Transite Industrial Vent Pipe to exhaust corrosive fumes from the plant's small parts casting pots.

Made of asbestos-cement, Transite® retains its good appearance. Never needs painting or preservative coating. Resists the attack of most gases, mists, fumes, and dusts. Indoors or out, Transite offers you these same appearance and maintenance-free advantages. Let us send you DS-336—a 24-page brochure on Transite Industrial Vent Pipe. Write Johns-Manville, Box 14 FA, New York 16, N. Y. In Canada, Port Credit, Ontario.

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Chief Maintenance Engineer

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Roundtable Productions, 139 S. Beverly Dr., Beverly Hills, Calif.

Tractor Shovels and Their Care is a series of service training slidefilms. Of interest to the semi-skilled mechanic familiar with basic material handling machinery and servicing tools rather than torque converters or power shift transmissions. Step-by-step procedures are shown and technique is carefully explained. Seven color-sound slidefilms, 20 min. each. Write to:

Clark Equipment Co., Construction Machinery Div., Pipestone Rd., Benton Harbor, Mich.

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Boring Head Design is a filmstrip that shows construction and applications of high precision tools. Can be adapted to training machine operators in proper use and care of the tools. Color, sound, 11 min. For information, write:

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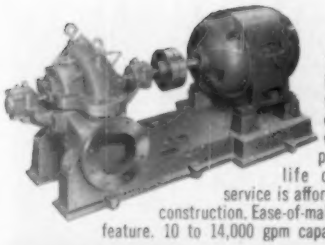

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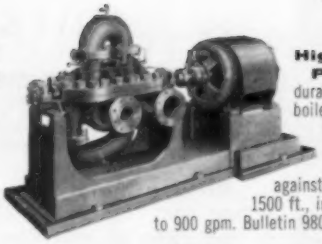

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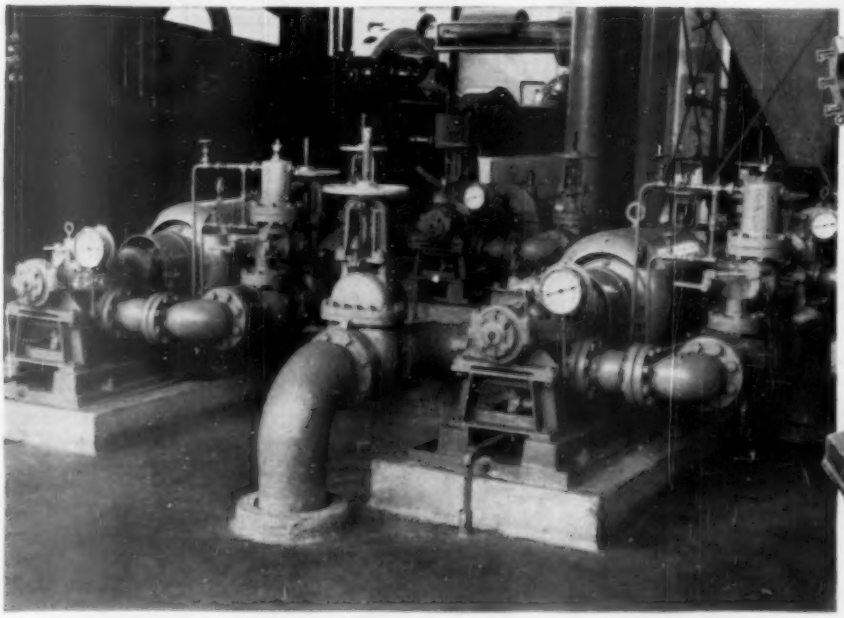

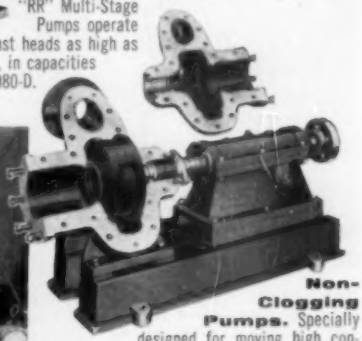

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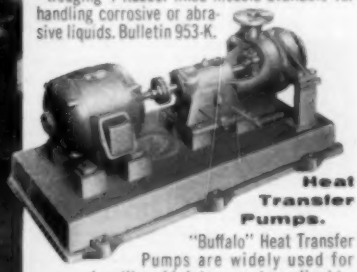

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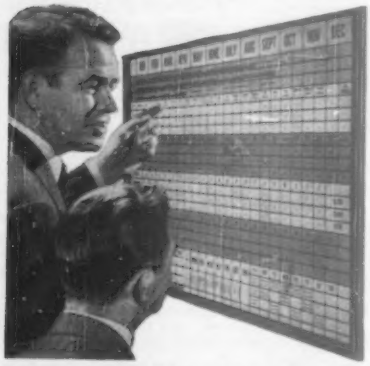

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ADVERTISERS' LITERATURE

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PUMPS AND PIPING

346—Piping Layouts. Free enlargement of Layout No. 82 sent upon written request. *Jenkins Brothers.*

347—Pumps. Bulletins and full information on complete line for varied applications. *Buffalo Pumps Div.*

348—Pipeline, Drainage Cleaner. Helpful data on flow-line and drain cleaning machine. *Kollmann Mfg. Co.*

349—Transite Industrial Vent Pipe. DS-336 (24 pages) gives complete data and applications. *Johns-Manville.*

350—Plastic Piping. Catalog describes features and anti-corrosive properties. *Colonial Plastics Mfg. Co.*

MAINTENANCE

351—Paints. Free booklet, "Color-Dynamics." Illustrated. *Paint Div., Pittsburgh Plate Glass.*

352—Floor Cleaning. Literature describes line of scrubber/vacuum floor machines. *Finnell System, Inc.*

353—Lubricants. Free: "Management Practices that Control Costs via Organized Lubrication." *Texas Co.*

354—Silicone Based Paints. New brochure gives facts of paints formulated with silicones. *Dow Corning Corp.*

MATERIALS HANDLING

355—Pallet Containers. Data on palletainers, plus case histories, now available. *Union Steel Products Co.*

356—Steel Shelving. New catalog describes complete line of steel shop equipment. *Borroughs Mfg. Co.*

357—Hoppers, Self-Dumping. Full details upon request. Capacity: ½ to 2 cubic yards. *Roura Iron Works, Inc.*

358—Corrugated Boxes. Literature on new M/R corrugated board for stronger boxes. *Hinde and Dauch.*

359—Cranes. Catalog (26 pages) of informative data and performance features. *Euclid Crane & Hoist Co.*

360—Screw Conveyors. Folder 2489 gives complete data on new line of screw conveyor components. *Link-Belt Co.*

361—Steel Shelving. Free catalogue describes line and features for solving storage problems. *Frontier Mfg. Co.*

362—Tote Boxes. Catalog gives data on tote-box line, other handling equipment. *Wear-Ever Aluminum, Inc.*

363—Hoist. Bulletin H-5 describes new heavy-duty hoist. Capacity: 1000 to 40,000 lb. *Harnischfeger Corp.*

364—Conveyors. Bulletin 309 gives details on line of gravity and power conveyors. *Standard Conveyor Co.*

365—Casters, Wheels. Manual for helping industry choose job-fitted wheels and casters. *Darnell Corp.*

PLANT SERVICES

366—Aftercooler, Separator. Bulletin 711 contains detailed info and performance data. *R. P. Adams Co., Inc.*

367—Paper Towel Dispensers. Free bulletins illustrate economies of rolled paper dispensers. *Steiner Co.*

368—Posture Chairs. Catalog No. 7001 fully describes features of telescoping chairs. *Royal Metal Mfg. Co.*

369—Dust Collectors. Bulletin 922 discusses features of Ventrijet wet dust collector. *Pangborn Corp.*

370—Heat Exchangers. Bulletins 120, 124, and 135 give complete information. *Niagara Blower Co.*

371—Compressors. Catalog No. 37 lists complete line. Sizes ¼ to 50 hp. *Brunner Div., Dunham-Bush, Inc.*

372—Slotted Angle. Brochure shows how fixtures and equipment can be built with less material. *Acme Steel Co.*

373—Metal Lumber. Catalog gives data for making tables, stands, catwalks, racks, etc. *Republic Steel Corp.*

374—Steel Lockers. Information and facts on bonderized steel lockers. Features explained. *Republic Steel Corp.*

375—Water Treatment. Free: "Your Most Important Raw Material." *Hall Laboratories Div., Hagan Chemicals.*

376—Photo Panels. Literature on quick way to reproduce lists for directories, catalogs, etc. *Acme Visible Record.*

377—Reproduction Materials. Booklet shows short cuts possible in drafting and print room. *Eastman Kodak Co.*

378—Communication Systems. Information on independent telephone system. *Automatic Electric Sales Corp.*

Turn the page

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You can have a PAGEMASTER system engineered to your own requirements, whether yours is a single or multi-building operation. Systems are available for lease or purchase. As your needs grow, you can add receivers without additional installation cost.

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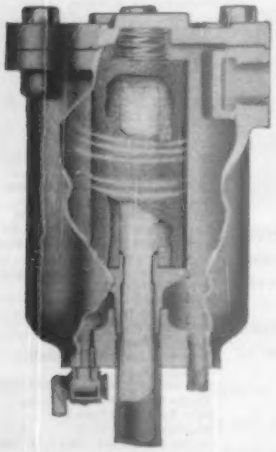

The R. P. Adams Poro-Stone air filter is engineered to efficiently remove entrained oil, water and pipe scale from compressed air lines. Liquid droplets and solids being carried by the gas stream are first removed by centrifugal action in an annular chamber. Secondary filtration is achieved by passing the air or gas stream through a Poro-stone unit. An automatic trap can be provided to discharge the residue from the cyclone chamber.

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The units require virtually no service or maintenance — thereby insuring continued trouble-free, low cost performance.

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ADVERTISERS' LITERATURE

Begins on page 200

Offered in ads received up to 5th of last month. To get items you want, circle numbers on Reader Service Card next to back cover.

379—Compressors. Bulletins 16B8244 and 16B8162 on 12 sizes of rotary compressors. *Allis-Chalmers Mfg. Co.*

380—Unit Heaters. Bulletins 3137-E and 3704 on lowboys and highboys give complete details. *Buffalo Forge Co.*

381—Corrosion Inhibitor. Bulletin 410-12-3 gives data on aid to closed-water systems. *Hagan Chemicals.*

382—Dust Collectors. Literature on complete line of self-contained models for single machines. *Aget Mfg. Co*

383—Unit Heaters. Free copy of "Modern Heating" tells how to solve plant heating problems. *Reznor Mfg. Co.*

BUILDINGS

384—Rolling Steel Doors. Catalog G-59 gives specifications, features, applications. *R. C. Mahon Co.*

385—Fir Plywood. Data on specific plywood uses and specifications. *Douglas Fir Plywood Assn.*

386—Floor Armoring. Catalog (20 pages) tells how gridsteel eliminates floor damage. *Irving Subway Grating Co.*

ELECTRICAL

387—Motor Controls. Bulletin 514 gives details. NEMA sizes 0 through 5. *Federal Pacific Electric Co.*

388—A-C Motors. Brochure lists complete line slip-ring or squirrel-cage type, 1 to 600 hp. *Brook Motor Corp.*

389—Starters. Bulletin 2510 B-C gives complete data and performance features. *Square D Co.*

PRODUCTION

390—Riveters, Clinchers. Bulletins 646 and 555 give detailed information. *The Tomkins-Johnson Co.*

391—Honing Machines. Catalog lists full line and features for varied applications. *Superior Hone Corp.*

392—Metal Cutters. Catalog lists complete line for every metal-cutting operation. *H. K. Porter, Inc.*

393—Tachometer. Catalog 148-H describes hand tachometers, portable and stationary. *Jones Motorola Corp.*

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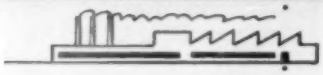

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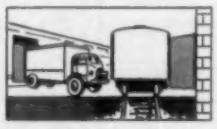

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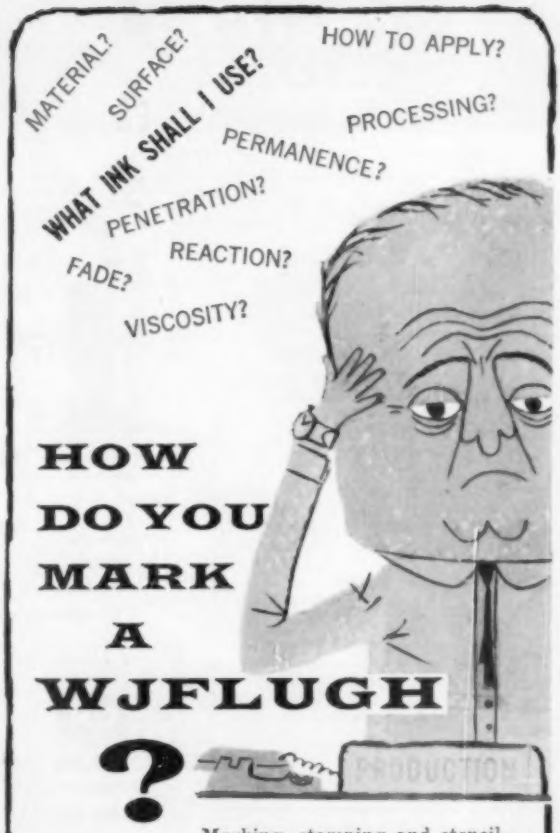

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ADVERTISERS' LITERATURE

Begins on page 200

Offered in ads received up to 5th of last month. To get items you want, circle numbers on Reader Service Card next to back cover.

394—Cleaning, Finishing. Info on system, performance data. *Cincinnati Cleaning & Finishing Machinery.*

395—Marking Devices. Free handy ink guide, checklist, and catalog upon request. *Speedry Products, Inc.*

396—Multi-Runners. Bulletin 580 describes features of multi-spindle fasteners. *Chicago Pneumatic Tool Co.*

397—Fabricating Facilities. Data on contract manufacturing facilities and equipment. *Republic Steel.*

398—Staplers. Bulletins tell how stapling saves time and money for many kinds of users. *Bostitch, Inc.*

399—Schedule Board. Bulletin X-100 shows varied applications of visual control board. *Graphic Systems.*

400—Filters, Liquid. Catalog sheet on Model G-141J filter for handling variety of fluids. *Purolator Products.*

401—Flexible Tubing. New data book shows applications, properties, sizes. *Penna. Flexible Metallic Tubing.*

MISCELLANEOUS

402—Silent Chain Drives. Book 2425 (88 pages) covers complete line, capacities, applications. *Link-Belt Co.*

403—Industrial TV. Illustrated brochure covers industrial TV equipment and systems. *Philco Corp.*

404—Cost Controls. Illustrated brochure F-2 tells about automatic punched-card controls. *Royal McBee Corp.*

405—Gloves. Guide with "wear test" performance chart chooses right glove for every need. *Hood Rubber Co.*

406—Scales. Bulletin 2017 gives details on new printed-weight recording scale. *Toledo Scale Co.*

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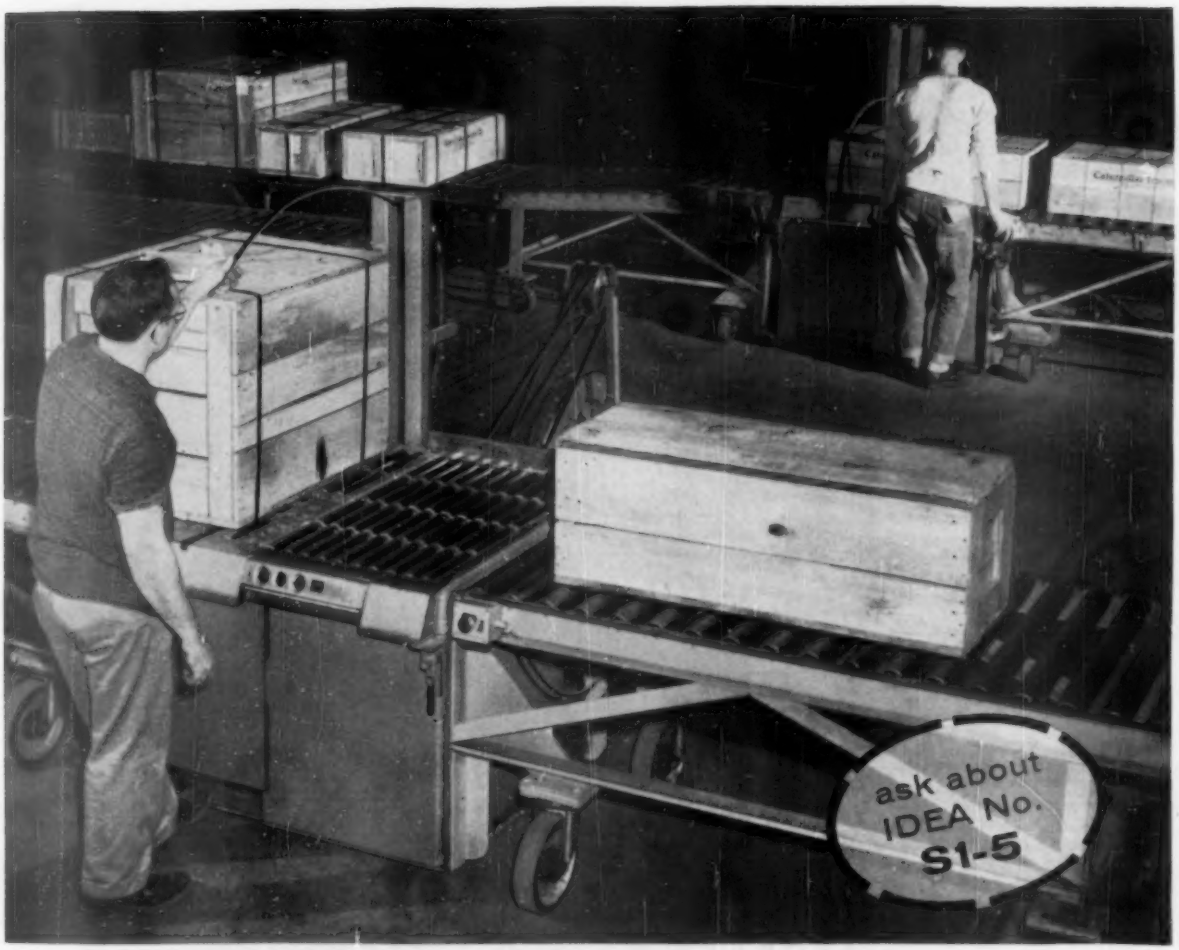

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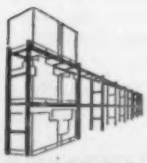

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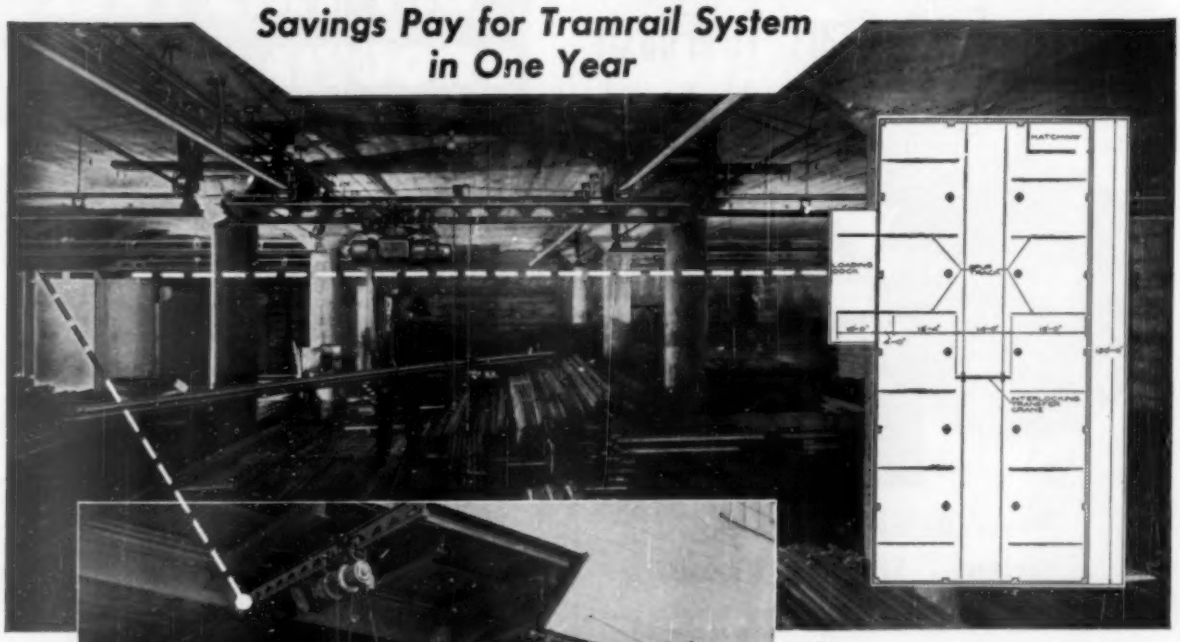

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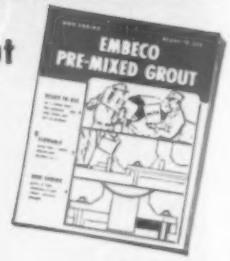

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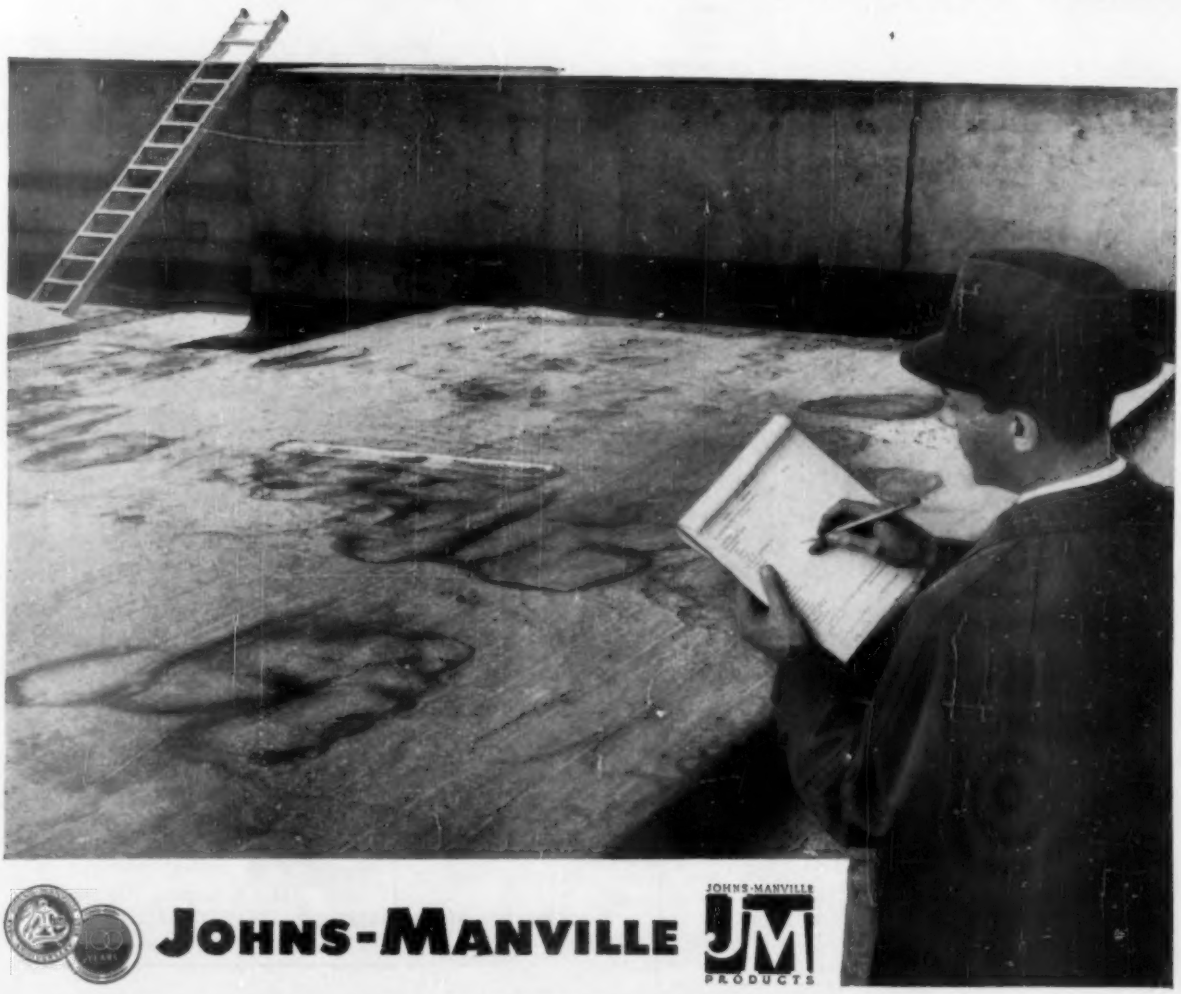

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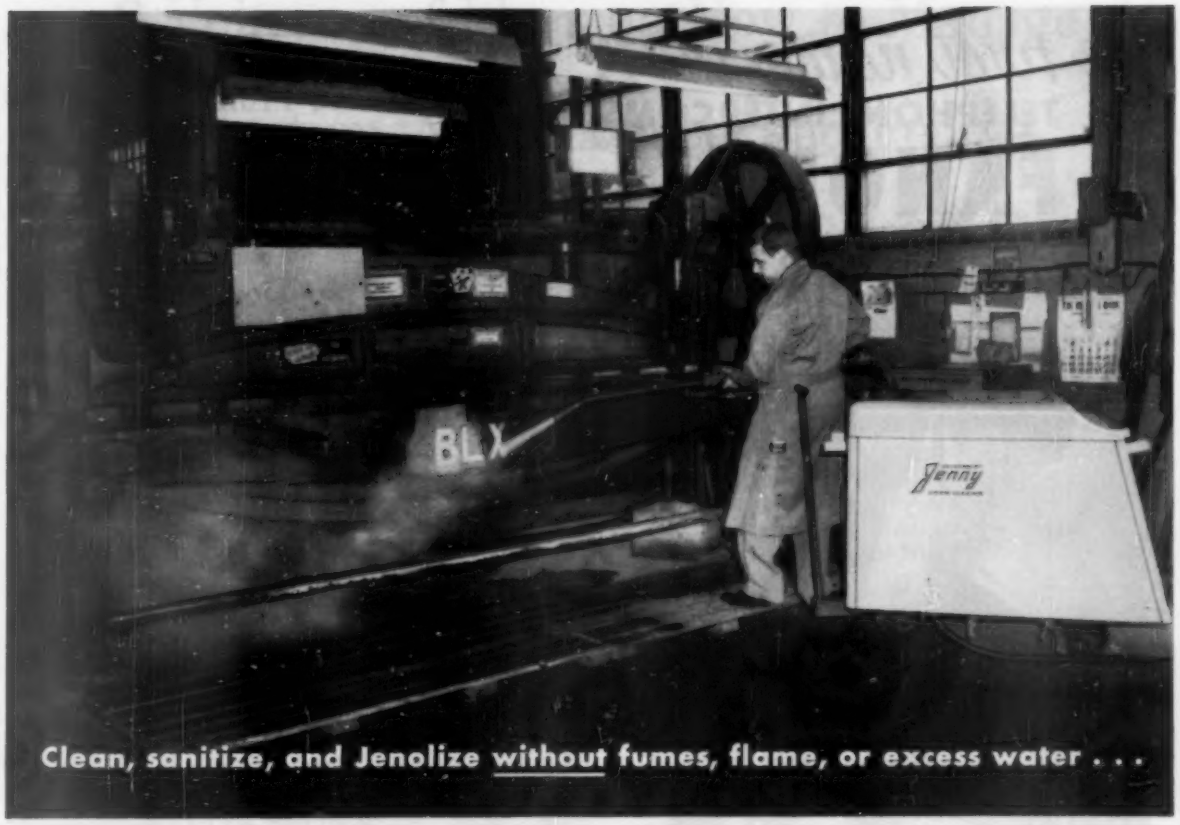

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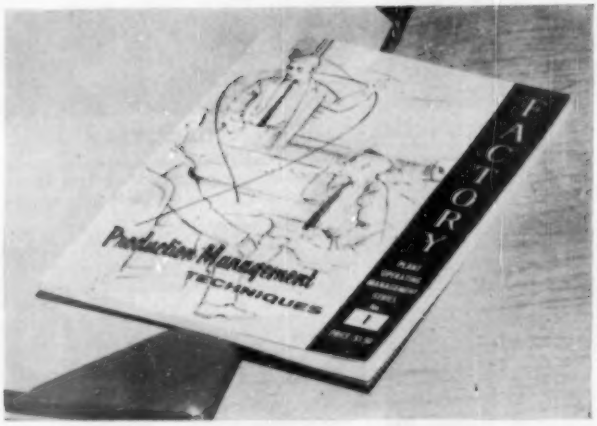

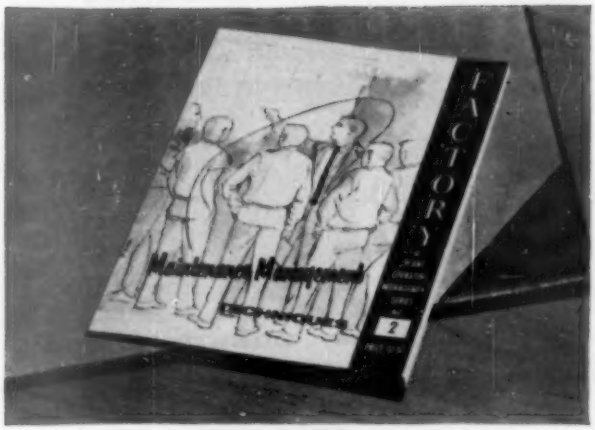

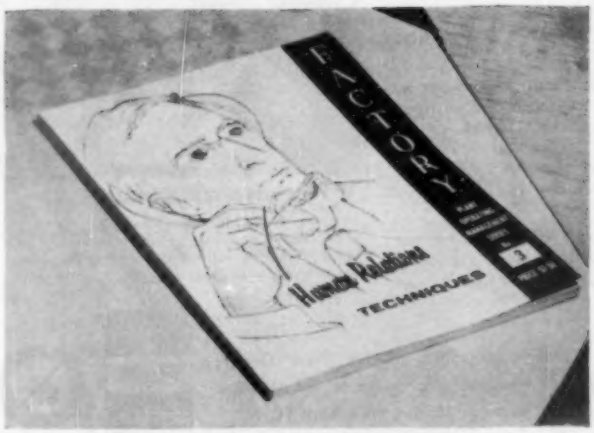

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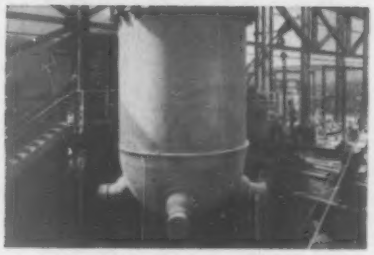

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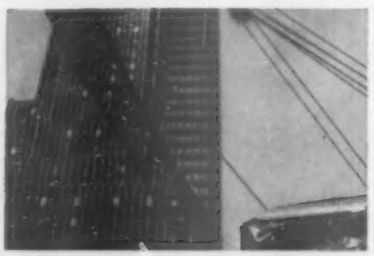

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Add them up and you have the makings of another big upswing. Wise planners, builders and buyers will act now to get ready for it.

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Marketing includes sales, consumer research, product and package design, advertising and public relations. All need new skills every year —and *many thousands* of new workers!

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Box marking is but one of several basic areas in which a Markem Method can save money and help sales. Similar cost-saving Markem Methods – using direct, offset and screen process printers – identify or decorate pressure-sensitive and fabric tapes; tags and labels; plastics products; leather goods; glass and china products; and countless others, for all industries. You can get the benefits of 47 years of experience in *all* types of marking, by sending your requirements – and, if possible, samples to be marked – to Markem Machine Company, Keene 18, N. H.

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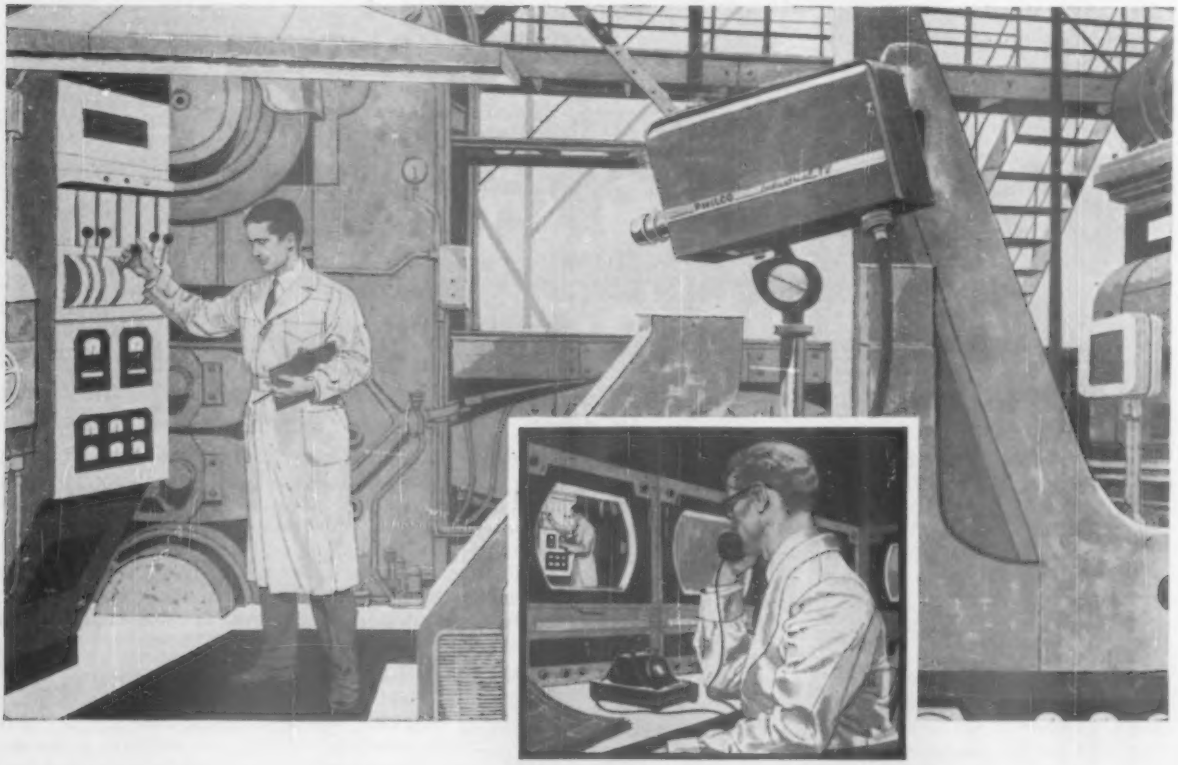

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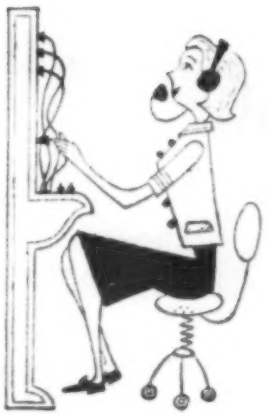

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To help you, here is a list of catalogs described in this issue. To obtain, circle key numbers on either postcard.

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1—Manometers
2—Testing Instruments
3—Drum Type Controllers
4—Timers
5—Test Equipment
6—Process Instruments
7—Gages
8—Recorders, Panel Instruments
9—Electron Optics

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18—Fork Lift Trucks

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22—Sump Pumps
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50—Roller Bearings
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56—Floodlights
57—Framing, Metal
58—Framing, Slotted Angle
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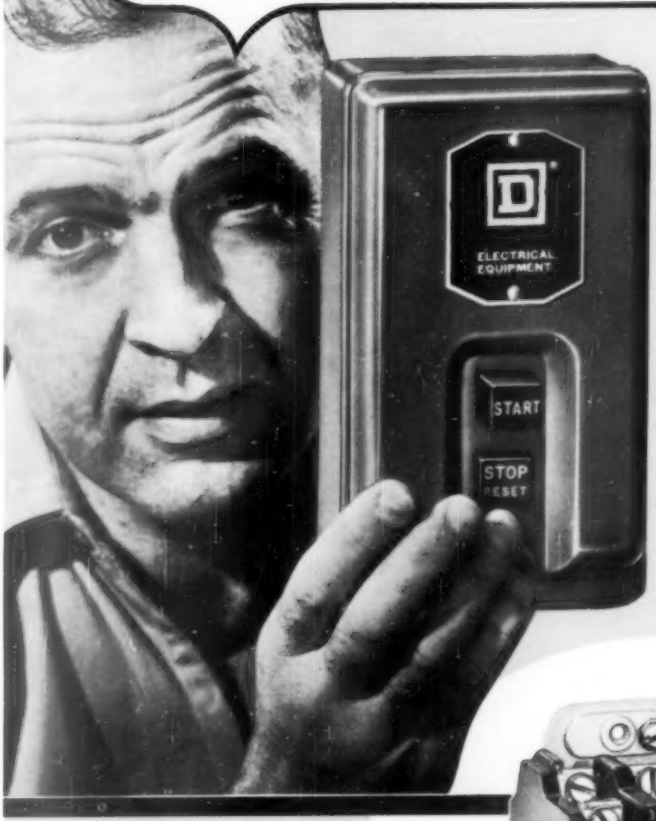

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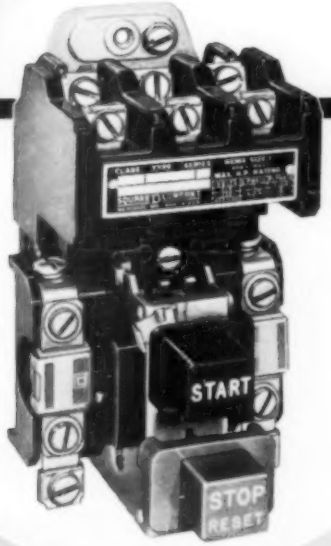

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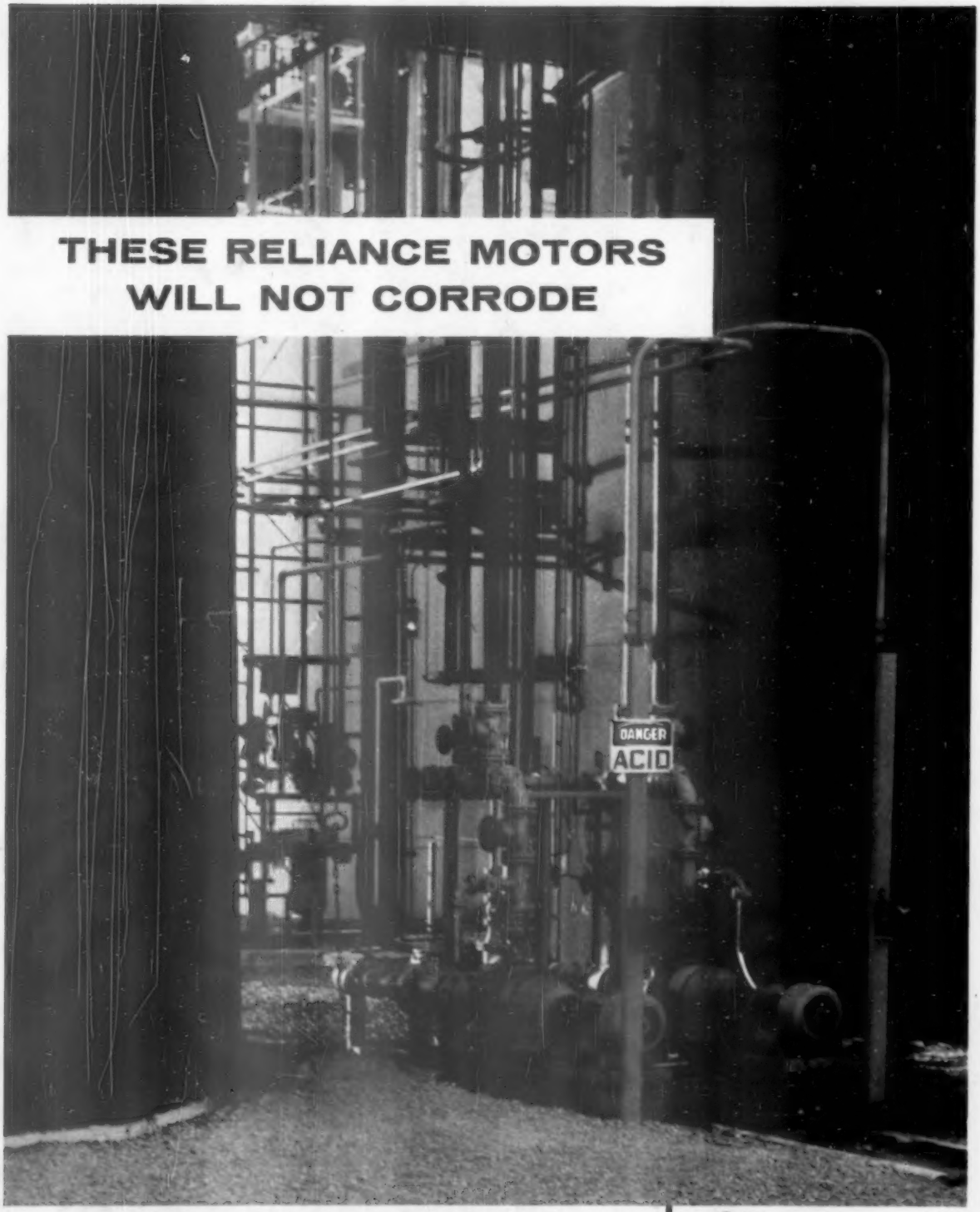

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